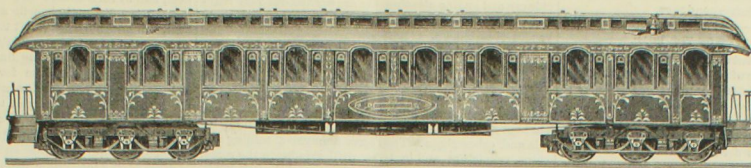


NATIONAL CAR AND LOCOMOTIVE BUILDER.



VOLUME XVII.
NUMBER 5.

MAY, 1886.

{ SINGLE NUMBERS, TEN CENTS.
\$1.00 PER ANNUM.

Miscellaneous Items.

The daily work of locomotive engineers in Germany varies from four to five hours per day for fast trains to ten hours for freight trains. The engineers get every fourth, fifth or seventh day for rest. Switchmen have a day off every two weeks.

SOME roads have adopted the plan of numbering the berths of sleeping cars in distinct figures on the outside of the curtains. Passengers speak very highly of the convenience of the practice, and we see no reason why it should not be universally adopted.

MR. MATT. ELLIS, Master Mechanic of the Chicago, St. Paul, Minneapolis & Omaha Railway, was the first inventor to patent a method for operating a snow flanging apparatus with compressed air. The flangers he has used are very successful. He is prosecuting several infringers of his patent.

SOME peculiar locomotives have been built in Germany for operating the heavy grades over the Hartz Mountains. The designer, Herr Schneider, takes great credit for designing the engines, which are said to work very successfully. They are a modification of the locomotives designed and built in this country forty years ago by Mr. George Esol Sellers for service on steep grades.

A COMPANY has been formed at Wilkes-Barre, Pa., for the manufacture of car wheels by machinery, by a newly invented process by which sixty wheels, complete in every respect, can be made in one hour. The first wheel was turned out March 13, in the presence of a number of machinists, capitalists and others. The wheel was made in less than one minute. If there are no drawbacks to prevent, the invention is destined to revolutionize the business of molding car wheels. A large amount of capital is said to have been subscribed, and a site is being selected by the company on which to erect a factory to manufacture the wheels.

It is stated that a company has been started in California to manufacture boiler liquid from the leaves of the eucalyptus tree, and that twelve tons of leaves are used daily in the process. The leaves are put into a set of special boilers, or still, and the juice extracted from them by boiling. The liquid finally obtained is bottled; and when put into ordinary boilers along with the water, it prevents "scaling" or reduces the "scale" already formed on the boiler. The fluid is also said to prevent rusting and pitting in marine boilers, and to have been adopted by the United States navy.

AN important feature about the location and arrangement of the car shops belonging to the Pan Handle railroad, at Indianapolis, is the advantage taken of the light grade on which the shops are built. The ground slopes towards the west, and the freight cars to be repaired are placed upon the tracks to the east of the shops. As the repair work is done, the cars are dropped down without the aid of a shifting engine, which always saves work and often prevents delay. The arrangement of the shops and yard is such that the passenger and freight cars do not get mixed together.

The officers of the New York, Lake Erie & Western Railroad contemplate making important changes in their methods of doing work in division shops. The new policy is to concentrate work in the larger shops more than has hitherto been the custom. In pursuance of this policy, it is the intention to make material reductions in the staff of workmen employed at out stations, and do the work where better facilities are provided. It is said that Salaman will lose about 100 men under the change, and that no car building will be done there. Other small shops will be reduced in like proportion.

The Boston Journal says: A new and improved style of car wheels have made their appearance, combining the qualities of safety and low price. They are made at the works of Fried. Krupp, Essen, Germany. The tire is forged steel, with a wrought-iron coil disk center. The two parts, being welded together, form a perfectly indestructible wheel in one piece. About 60,000 are now in use in Europe. The first of them seen in America were imported recently for the Boston & Providence Railroad Co.,

whose second order is now being filled. The New York, Providence & Boston road has also placed a trial order.

SEVERAL alterations have recently been made in the standard 40,000 pounds box car of the Union Pacific Railway Company. The new cars of a large order recently given to a contract shop are specified to be 34 feet long over end sills. The width is 8 feet 2 inches over side sills, and the height from bottom of sill to top of plate is 7 feet 6 inches. The extreme coupling length is 36 feet 6 inches, and the height from rail to top of brake wheel is 13 feet 4 inches. Diamond trucks of the company's standard are used, the wheels are 33 inches diameter, and the axles are of the M. C. B. standard. The Westinghouse automatic freight brake will be put on all the cars.

MR. DAVID L. BARNES, of the Rhode Island Locomotive Works, has been investigating the most economical point of cut-off for locomotives. He holds that the high steam pressures and high piston speed of locomotives are in favor of higher expansion than that which finds favor in stationary engine practice, but that the exposed condition of the cylinders and various other considerations are against it. The investigations he has made, led him to the conclusion that a locomotive will do more work per pound of coal, cutting off at 38 per cent. of the stroke than at any other. With an engine having a 24-inch stroke, this would make the most economical point of cut-off the 9-inch notch.

OWING to a fire which burned down the car shops belonging to the Northern Pacific Railroad at Brainerd, Minn., there was a sudden hegira of some 200 workmen from Brainerd to the new car shops at Como, near St. Paul. Quite a number of passenger cars were scorched by the fire, and the new shops have opened up with a heavy rush of work. Mr. J. C. Barber, formerly master car-builder at Brainerd, has taken general charge of the new shops, and he has already got every thing running like clockwork. The passenger car work formerly done at Minneapolis and several other points will now all be done at Como, the policy of the mechanical department being to concentrate the work at a few points easily reached.

PROTRACTED and carefully conducted tests have lately been made in Germany to ascertain the relative expense of operating street railways with horses, electricity and caloric motors. The caloric motor was the Honigsmann caustic soda locomotive, described in the April number of the CAR AND LOCOMOTIVE BUILDER. The trials were carried out by the Great Berlin Street Car Company, and the results have just been made public. Both the electric and caloric motors worked satisfactorily, causing no delays or irregularity of travel, but in both cases their operation was much more expensive than the cost of working the cars with horses. The company found no reason why horses should be displaced by the motors at greater expense.

A CURIOUS accident lately happened to a freight train on the Central Iowa Railway. While ascending a grade the train broke in two and the hind part was left. After getting to the top of the hill there came a down grade. While descending this, a car in the portion of the train that was left jumped the track and ran along for a mile, breaking nearly all the fish-plate bolts on one side of the track. Then a bridge was reached, and the cars piled up on it and knocked it down. The coupling broke and the engine went on without knowing of the disasters left in its wake, but the missing portion of the train was discovered before the engine got to the end of the division. We did not hear that master mechanic Player had given that engine crew a chromo for vigilance.

DURING the month of January, 1886, the Chicago & Northwestern Railway Company possessed 681 locomotives. A train mileage of 1,696,458 was made throughout the month. Deducting 8 per cent. for superannuated locomotives and those in the shops undergoing repairs, the average miles run per engine was over 2,600 miles. The work was done for a total expenditure of 20.26 cents per mile. Under this is included the whole cost of rebuilding, superintending and other expenditures pertaining to locomotive operating or repairs. The fuel cost 7.90 cents, oil .52 cent; engine-men, dispatchers and wipers wages amounted to 7.24 cents; repairs, which include superintendence, cost 4.6 cents per mile. Two of the locomotives burned wood, all the others used soft coal. Wood

was rated at \$2.70 per cord; coal at \$1.94 per ton. The oil charges included the oil used for headlights and hand lamps. The Westinghouse air brake is fitted on 385 of the locomotives, and 23 have got the American steam brake.

THE Lehigh Valley Railroad Co. have adopted a new fire gr. for their freight and passenger locomotives, which promises to be useful in saving coal. The company made their first trial of it several months ago on an engine running between Easton and Mauch Chunk, and so satisfactory was the result that they are now having their engines provided with the new grates as fast as they can be made. This new device was invented by Isaac W. Swallow, a locomotive engineer on the Delaware, Lackawanna & Western road. The grate is so constructed that the fire can be dumped from an engine or cleaned while the train is running at a high rate of speed. The grate is in two sections, and each operated by a lever in the cabin. The stationary bars extend the length of the entire grate, which are hollow, and through which water continually passes to keep the same from warping or clogging with cinders, while the alternate bars perform the shifting action for raking and cleansing.

THE stockholders of the Pennsylvania Railroad Company at a recent meeting passed a resolution instructing the directors "to enter into negotiations with the Central Transportation Company looking to acquiring the rights and property of said company, to the end that the profits from running parlor and sleeping cars may accrue to the shareholders of our company." This is a significant movement. The Pennsylvania Company has for some years, it is understood, been contemplating the taking of its sleeping-car service into its own control, and although it now has a contract with the Pullman Company, so much dissatisfaction has been expressed by many of the stockholders that it would not be surprising if the passage of this resolution eventually led to a radical change in respect to its sleeping-car service. Another resolution authorizing the company to organize its own express service was indefinitely postponed, the stockholders evidently being content to let what they consider well enough alone in that respect.—Railway Age.

THE cantilever system of bridge construction is no new thing, as many have been led to suppose, but is as old as the discovery of America, if not a great deal older. The following description of a bridge of this kind, constructed by native engineers in Japan a long time ago, is from Van Nostrand's Magazine: "At the sacred city of Nikko the other day, I was rather amused and interested at seeing a fine and very costly bridge of cantilever construction—abutments of hewn stone, shore piers, hewn granite, octagonal, monolithic, mortised for stone girders; monolithic plate beam to receive wooden superstructure. The stringers are fastened into the abutments, balance over the stone beam, but do not reach, by considerable distance, the gap being fitted by middle stringers let into the shore stringers. The Niagara bridge is a mere amplification of this one, built before America was settled, as a religious duty, very expensive, of thick, red lacquered work, and, like a bridge of angels, its planks are never profaned by the feet of the laity. But it seems queer-ike, to come away here to find our new inventions very old."

SOME of the railroads running out of Chicago are having trouble again about double-decked cars for sheep. A few months ago all the western and northwestern roads agreed to refuse all shipments of sheep in such cars, the reputed cause of this action being that the cars could not be used for return freight, while single cars could be so used. The shippers did not see the matter in this light, and alleged that the fear of having to handle hogs in double-decked cars was the real objection northwestern roads found that they had either to carry sheep in cars of this kind or depress the business of sheep raising, so they refused to hold to the compact prohibiting the use of double-decked cars, and the objectionable cars are again in use. The west and northwestern sheep raisers are now trying to induce the roads in these regions to adopt double-decked cars also, but so far they have not been successful. Commissioner Midgley has taken a decided stand against the introduction of double-decked sheep cars into the west and southwest, and offers to compromise by reducing rates on single-deck stock cars loaded with sheep.

Over the Northern Pacific Railroad.

Editorial Correspondence.

MECHANICAL SYSTEM OF THE ROAD.

The mechanical department of the Northern Pacific Railroad is run on the principle of holding the Superintendent of Motive Power responsible to the management for the condition of all machinery belonging to the road, and for the conduct of all employes engaged in the mechanical department. When the various departments of the road were organized, a general order announced that the Superintendent of Motive Power should have a general supervision and control over the motive power of the several divisions and of all employes of the machinery department, including master mechanics, master car-builders, foremen, locomotive engineers, firemen and workmen. That he should be empowered and required to have such tests made and records and reports of the same kept as would prove the relative value of fuels, lubricants and of the various kinds of material required in operating the road. He was required to keep a complete record of all rolling stock and to have all repairs done that he considered necessary, furnishing to the master mechanics and car-builders of the various divisions the drawings needful for directing the work that had to be done. He was also required to regulate all standards used by the road and to provide templates and gauges for maintaining the same.

The system of management thus outlined is followed on the road to-day, and works very harmoniously. In performing his business, Mr. G. W. Cushing, superintendent of motive power, makes frequent trips of inspection to the various mechanical quarters. He recently invited the writer to accompany him over the road on one of these business trips, and the following are notes taken by the wayside.

THROUGH THE SCENE OF A CYCLONE.

We left St. Paul on the evening of April 14th in the midst of a wild rain storm that was vivified by brilliant discharges of lightning, that at times were fearfully incessant. A few hours before the terrible tornado which has become historical, passed over a district on the line of our route about seventy miles from our starting-point. When we reached Sauk Rapids, the fitting lightning flashes and the cloud-dimmed light of the moon, revealed a weird scene of desolation and ruin. It is beyond our province to recount the events that led to the sudden destruction of some eighty human lives, but it may be proper to tell the effect of the cyclone on the railway property it encountered.

The depot at Sauk Rapids was obliterated. A few of the buildings struck by the wind were completely overturned, but most of them were treated as if crushed by a Titan steam hammer, and the fragments afterward scattered like mammoth chaff to the four ends of the earth. The railroad depot fared in that way. Twenty-nine cars on the side tracks were wrecked. Some flat cars loaded with ties were seized by the wind and turned upside down. All the cars within the course of the storm were overturned, but some of the box cars were very little damaged. The exposed sides of some of the cars were studded with flying splinters that stuck into the woodwork like arrows propelled from a strong bow, and in several cases inch boards pierced completely through the sides of the cars. The wreck caused very little delay to trains on the road. Mr. J. C. Barber, master car builder at Como, a veteran wrecking master, was on a train that was first to reach the scene of the calamity, and he quickly pulled the obstructions clear of the track.

BRAINERD MACHINE SHOPS.

We spent a day at Brainerd, Minn., which is the mechanical headquarters of the road. The machine repair shops made the town of Brainerd, and they constitute the most prominent feature about the place. The buildings are all substantial brick structures, arranged on the parallel plan and connected by transfer-tables. The principal buildings are one story high, with iron roofs covered with slate and lighted partly through the roofs. As each shop stands apart from other buildings, there is free access of light by the side windows, so that between sides and roof the shops are all admirably lighted. There are ample grounds belonging to the company beside the shops, so the means of future extensions are secured, and the shops are so constructed that extensions merely fill up the original plan.

The tools in the machine shop are arranged so that the heaviest machines are toward the middle line of the building where the track passes. The tools doing various kinds of work are grouped together. A light shaft is led along the shop above the stalls to supply motion for operating flexible shaft drills. Like most other Northwestern roads, the Northern Pacific is compelled to use feed-water that bring fire-box sheets and flues to grief prematurely. In the last three months they have put in five new fire-boxes at Brainerd, although work has been very quiet during that time. One of the fire-boxes is of iron, Mr. Cushing having decided to try if that material would stand the bad water any better than steel. We observed one fire-box in the boiler shop with the rivet heads inside. The plan is being tried as an experiment. The boilers of all engines belonging to this company are regularly tested by hydraulic and steam pressure every three months. When

the time for testing comes, it must be done wherever the engine may happen to be. Tests and examinations of machinery and engine attachments are carried out very regularly, with the result that failure on the road is getting to be almost unknown.

All the Brainerd shops are in charge of Mr. H. J. Small, master mechanic, and the orderly, cleanly way that the establishment is run reflects great credit on the presiding spirit. The tool room is the most complete place of its kind we have seen west of Chicago. Several men are kept at work making and keeping up small tools for this and other shops. They have a universal milling machine, two lathes and a twist drill grinder in the room. The place is provided with a complete set of Pratt & Whitney gauges, and the principal templates and jigs used in producing interchangeable pieces are stored in the tool room. All the small tools usually found in the best equipped tool rooms are kept here. An unusual feature found in this room is a case devoted to holding solid-ended wrenches and various kinds of spanners. They are arranged in pigeon-holes marked with the sizes, and a blue print on the side of the case indicates in which hole any desired size is to be found. Mr. McNaughton, the general foreman of the shop, takes an active interest in keeping the tool room up to the times, and his ardor in the work is heartily supported by Mr. Brown, who has charge of the room. In the way of special tools for the use of the shop they have recently got out a very successful device for turning the pins of cross-heads, also a radial arrangement that is attached to a planer for planing links, driver-brake shoes and other work that has to be finished to the segment of a circle. They are both different in several respects from the appliances generally used for these purposes.

An annex of the tool room is a room devoted to the repairing of all kinds of pumps, brake apparatus, injectors, sight-feed lubricators, hydraulic jacks and other fittings that require special knowledge as well as manipulative skill. This work is done by or under direction of a man who is an expert in what are particularly difficult operations. Special facilities are provided, adapted to the peculiar nature of the work.

A fine Corliss engine is used for running the machinery in the main shop. The boiler and blacksmith shops have each small engines for running their machinery. Steam for power and heating purposes is supplied from four boilers of the locomotive type. Jets for injecting air on the surface of the fire are on all these boilers, and they are effectual in preventing smoke.

The blacksmith shop of these works is the best provided with labor-saving appliances of any shop we have seen, except that of the Pennsylvania Railroad at Renovo, Pa. The foreman, Mr. N. W. Wheatley, is a mechanic who has departed from the traditions of his trade that require work to be done now as it was done by the forefathers of the craft. A significant objection that some blacksmiths have raised to this shop was that they might as well work in a machine shop. An immense number of standard forgings for locomotive and car work is finished under the steam hammer by specially designed dies and matrices. Some of the formers in use are very ingeniously designed. The introduction of the system has effected a saving of 50 per cent in blacksmith shop expenses, and at Brainerd has resulted in the closing up of a shop where the greater part of the car forgings were formerly made. As an illustration of how expeditiously work could be done by the system, the foreman had a solid-ended wrench forged out of a piece of old tire while we looked on. The wrench was double-ended with jaws 24 inches wide. It was finished in ten minutes. In addition to formers of every description, the shop is well provided with power tools. There are three steam hammers and a small tilt hammer, a very powerful combined punch and shears and several bolt-headers. In one of the latter they use an attachment for punching the oblong key-holes in brake lever bolts.

The offices and store rooms occupy a detached two-story building near the end of the machine shop. In connection with the works, a reading-room, library and night school are maintained in a handsomely fitted apartment in the office building. The men and boys are reported to take great interest in the school and reading-room. The selection of books has been very judiciously made, and all the leading railroad, mechanical and scientific papers are taken, besides many daily papers and magazines. Mr. Reynolds, the chief draftsman, an accomplished mechanical engineer, gives lessons in drawing and applied mechanics two nights each week. Some of the older men in the shop are working as hard in the drawing class as any of the youngsters.

Two weeks ago, the car shops, which were located across the main tracks from the general machine shops, were burned down. Plans for new shops were designed and approved by the management, drawings prepared, contracts for building let, and work commenced to-day, the 16th. This strikes us as an expeditious way of pushing ahead important business, but the officers appear to regard it as nothing worth mentioning.

NORTHERN PACIFIC BENEFICIAL ASSOCIATION.

On the bluffs overlooking the Mississippi River, just outside of Brainerd city limits, stands the "Sanitarium" belonging to the Northern Pacific Beneficial Association. This association is composed of the officers and regular

employes of the railroad, and its objects are to provide relief for its members when disabled by accident or sickness, and at their deaths to give slight aid to their families. It is a distinctly benefit society for the living, however, life insurance being left to other organizations. The dues are light, and are regulated according to the wages received by members. The fine hospital at Brainerd provides a comfortable asylum for members suffering from sickness or accident, and it contains patients from all over the Northern Pacific Railroad system. In the course of a visit to the establishment, we were impressed with the comfortable accommodation provided for the men that become temporary inmates, and of the deep interest in the welfare of the institution displayed by the house-surgeon, Dr. Bigger.

ON THE ROAD.

Leaving Brainerd on the evening of April 15, we passed through a long stretch of pine woods that were followed by the great wheat fields of Dakota. Every locality has its peculiar fashions and foibles, and the amiable weakness of this district is the ambition of men in all walks of life to own a wheat farm. Every business man in Fargo is said to own such kind of property, and most of them are immensely proud of their possession, even though in many cases lordship of the soil proves an expensive luxury. When morning broke we were still speeding on through treeless wheat farms, with now and again an arid stretch of rocky bluffs and sandy plains. The whole wayside is studded with pleasant sheets of water teeming with water-fowl. But more attractive still, on all sides there are the eloquent traces of industry, that is making the wilderness blossom like a rose, and cheerful homes are rising in every quarter. We left Brainerd in the "business car," used by the officers of the road, and we were at the back end of a train of thirteen cars crowded with passengers. Many have dropped off with their belongings at the various stations along the wheat fields. Most of them were sturdy, thrifty-looking people, who will put their mark for good on the face of Nature. Nearly all the land between St. Paul and Bismarck has been bought by settlers.

This letter is finished just as the train is reaching Mandan, the division quarters beside Bismarck. Notes on this district will be delayed for another paper.

SHOP NOTES.

Editorial Correspondence.

CHICAGO & ALTON RAILROAD SHOPS.

Mr. Wm. Wilson, superintendent of machinery of this road, had 17 locomotives in the machine shop during a recent visit we made to Bloomington. The repairs on a few of the engines were equivalent to rebuilding. He is building one new locomotive, and is equipping her with his new valve motion, recently described in the CAR AND LOCOMOTIVE BUILDER. The engine that is already running with this motion has made an excellent record on both freight and passenger service. The superior distribution of steam makes the engine smart at handling a train and economical in the use of steam, and the mechanism gives every indication of being extremely durable. This motion is operating a single valve very successfully, but that was only a small part of the object the inventor had in view when he designed the motion. It was intended as a simple and efficient means of operating double valves, one controlling admission, the other regulating release. To carry out this purpose a special form of steam chest was necessary, and this was designed, and has lately been covered by a patent. Mr. Wilson is now getting out the material for a new locomotive that will have the motion operating double valves. The motion is so arranged that nearly a full port opening can be given while cutting off at 13 per cent. of the stroke. The exhaust can be so regulated that release will take place at any desired point from 50 to 92 per cent. of the stroke. The claim is made that enough steam can be admitted while cutting off at 3 inches of a 24-inch stroke, to do as much work as is now accomplished by a link-motion engine admitting steam up to 6 inches, and we see no reason to doubt it.

Mr. Wilson is building an iron transfer table for the car shops, to be operated by power transmitted by a wire rope. Mr. Townsend, master car-builder, is building 100 freight cars, but otherwise business is dull in the wood-working establishment.

CHICAGO, ROCK ISLAND & PACIFIC SHOPS.

The Chicago, Rock Island & Pacific Railway Company are building six new locomotives at their shops at Chicago, with cylinders 18x24 inches, driving wheels 66 inches diameter, and straight boilers 56 inches diameter, with 184 two-inch flues. The boiler and fire-box are steel throughout. Mr. Twombly, general master mechanic, is greatly in favor of steel castings, and that material is used freely in these locomotives. Cross-heads, rocker-arms, link hangers and various other parts, are made from steel castings. They find steel cross-heads better than reinforced cast iron, for their experience has been that the cross-head breaks diagonally from the neck of the piston rod boss, where a wrought iron bolt passing through the cross-head wing is no safeguard.

The Walker patent smoke-consuming locomotive that was pushed prominently before railroad men a few years ago, is in the C., R. I. & P. shops at Chicago, undergoing

extensive alterations. The engine has been a failure hitherto, and we do not see any thing in the alterations calculated to make her a success. The best smoke-consuming, or, rather, smoke-preventing, locomotive in use has a brick arch or its equivalent, and means of regulating the admission of air above the fire. Any master mechanic can construct such a fire-box, and no patentee dare say what does thou?

CHICAGO, ST. PAUL, MINNEAPOLIS & OMAHA SHOPS.

The machine shops for the locomotive department of this road are located on the bank of the Mississippi River on the outskirts of St. Paul. The ground occupied by the shops is a limestone plateau about fifty feet above the bed of the river, beautifully situated and well provided with the means of easy drainage. All the buildings are brick and are set on a rock foundation. The buildings are arranged on the oblong grouped plan, the whole forming a rough parallelogram. Most of the shops are single story, lighted by sides and through roof. The machine and erecting shop is 250 by 125 feet and has ten stalls. The shops were built when the road had only 25 locomotives. They now have 186 and 10 new ones are on the way from the Schenectady Locomotive Works. Nearly all the repair work for 1,900 miles of road has to be done here, and the facilities are already too limited. They have the very best tools that can be bought, and have added \$4,000 worth of new shop tools within a few months, and this is the only way they can keep abreast of the repair requirements. Mr. Matt Ellis, the master mechanic, has very decided views about the economy of using good tools, and the establishment bears the imprint of his opinions.

There are ten engines undergoing repairs, most of them getting heavy boiler work done. On certain divisions of the road, the feed-water is very heavily charged with scale-forming ingredients, which leads to extensive boiler repairs. Two of the engines are getting new fire-boxes, and one of them is getting a new outside shell for the fire-box. On one division of the road there is alkaline water impregnated with lime. Engines running there have to get their flues cleaned every six or eight months. Several of the fast passenger engines are having driving wheel centers enlarged from 56 to 63 inches, with 4 inch tires. About 60 per cent. of the engines are equipped with the Westinghouse air brake apparatus, and a great many of these have driver brakes. Very little trouble is experienced with the tires hardening in spots.

Mr. Ellis has got a finely equipped tool room, all the best modern small tools and gauges being in it. The check system is used in giving out tools to the workmen.

The machine shop and smaller offices are heated by the exhaust steam from the stationary engine, after the Osborne system. During the coldest winter weather the shop has been kept comfortably warm with a maximum back pressure of 5 pounds. The system has been in use five years, and has cost nothing for repairs. In the engine house there is a large pump for maintaining water pressure in case of fire. There is also a boiler testing injector, an apparatus for testing Westinghouse air pumps, and a sand blast for sharpening files.

A transfer-table connects the machine shop to the round-house. The latter is a clean, well kept house of 20 stalls, heated with live steam. Parallel to the transfer-table pit, on the roundhouse side, is the boiler shop, a building 100x80 feet, well provided with the tools of the trade. On the opposite side of the machine shop is the blacksmith shop, the dimensions being 100x80 feet. This shop contains 12 fires, a steam hammer, a bolt-header and a spring furnace. Movable smoke-jacks are provided, which can be pulled down on the fire low enough to prevent the gas and smoke from filling the building. They are said to be very efficient. Apart from the other buildings is the oil house, the cellar of which is cut out of the solid rock, and provides room for four tanks, that each hold 10,000 gallons of oil. The chamber is covered over with heavy paving stones which form the floor of the upper house. Steam pipes supply heat to keep the oil at proper consistency. Beyond the oil house is the stone house, a two-story building 150x100 feet. The greater part of the stores required to run the road are kept in this building, and they are admirably arranged. The lower part of the building is devoted to the storage of the rough castings and forgings generally found lying outside.

ST. PAUL, MINNEAPOLIS & MANITOBA CAR SHOPS.

These shops are full of work at present getting the passenger equipment ready for the summer business. The road does a heavy passenger business in summer, and the cars are kept in first-class style. The company run their own sleepers and find it a good paying arrangement, and their patrons are said to like the plan. The road owns 102 day passenger cars, 20 sleepers and 44 baggage, mail and express cars, which is quite a heavy equipment for a Northwestern road, 1,500 miles long. Most of the cars were built by Barney & Smith, and they have proved quite durable in service. They have lately been putting the standard roof on all their passenger cars, and intend to have them all uniform; 18 new roofs of this kind have been put on since the year began. At present they have 17 coaches in the shop undergoing repairs, but most of them are merely being cleaned and varnished.

In freight car repairing work is light. They do very little new work in these shops, but occasionally when they

have been urgently in want of freight cars, they have built new ones. During one month they built 300 freight cars. A considerable part of the lumber used in freight car construction is got on the line of the road. The company are said to intend building a large new shop this season for freight car repairs. They are so crowded in existing shops that a great part of the freight car repairs has to be done outside, and the climate of this region is scarcely adapted for outdoor work.

Mr. T. Downing is master mechanic and car-builder, and he is ably assisted in the latter department by Mr. Wm. Patterson, car shop foreman, and by Mr. R. W. Taylor, paint shop foreman.

CHICAGO & NORTHWESTERN SHOPS, AT CHICAGO.

Work is rather slack in these shops at present, various causes contributing to this condition. Business on the greater part of the road is unexpectedly light for this season of the year, and the rolling stock has been kept in such a high state of efficiency that the company can reduce expenditure for repairs and renewals without impairing the efficiency of the plant. During a recent visit we found twelve locomotives in the repair shop, but most of the work being done upon them is light. The extension smoke-box is being applied to all the locomotives that pass through the repair shop. Mr. Tilton is highly satisfied with the performance of the engines that are running with this form of spark arrester. They are using a single nozzle and open stack contracted to form a frustum of a cone at the base. The single nozzle is level with the top row of flues, and is used without any lift pipe. Where double nozzles are used, a short lift pipe is set between them and the base of the stack.

The car shops, which are presided over by Mr. W. A. Scott, assistant superintendent of machinery, have no new work on hand, but they have just finished two beautiful business cars, one for the officers of the Chicago, Minneapolis & Omaha Railway, the other for the Elkhorn Valley division of the road. These cars are 35 feet long over sills, and the width is 9 feet 7 in. All appliances necessary for providing comforts and for preparing the necessities of life during a long journey, are in the car. No labor or expense has been spared to make the interior comfortable and pleasing to the eye. There is a very compactly arranged kitchen, with Wilks cooking range, refrigerator, cupboards, dish-washing sink, and all conveniences calculated to promote the culinary art. We have often seen galleys where cooking had to be done for whole ship loads of people, with fewer conveniences than those provided in the kitchen of these cars.

Each car contains four sleeping sections, besides two sofa beds, and sofa bed and upper berth for cook and porter. The inside of the car is finished with ash trimmed with 'birds-eye maple and cherry. Spaces at each end are kept for observation rooms. Large plate glass windows make these rooms unusually bright, and provide unfettered vision for the sightseer or track inspector. Six-wheel trucks carry the cars, the wheels being of the Allen paper make 33 inch diameter.

In the paint shop they had two very handsome sleeping cars just received from the builder. These cars are 75 feet long, and have 14 sections. The inside of the cars are finished with a rich looking dark mahogany, and the roof is finished in ash. The outside of the upper berths is inlaid with marquetry decorating that is executed with rare taste and skill. The seats are of a new design. They are wider and slightly higher than the ordinary seat, and the back is of a new shape that a tired anatomy takes very kindly to. The seats are upholstered with brocade plush, old gold color. The stateroom is magnificently equipped and artistically finished. Plate glass is used in doors and windows. The lavatory is made of chocolate-colored mottled marble. Each berth is provided with an electric bell. The cars are carried by two trucks, each having six 36-inch Allen paper wheels. The cars are run by the Central Sleeping Car Company, and their luxuriant equipment shows a desire on the part of the company to make their patrons comfortable.

CHICAGO TYRE AND SPRING WORKS.

These works, which are located at Melrose, about ten miles from Chicago, on the Chicago and Northwestern Railway, are fairly busy. During a recent visit we found they were turning out about 170 tons of tires and about the same weight of springs monthly. Liquid fuel is used exclusively in the furnaces throughout the establishment, and it is highly spoken of for the uniform character of the heat provided. The tires are all made from imported blooms. An ordinary sized bloom will be ready for rolling ninety minutes after being put in the furnace. The rolling machinery is all nearly new, and is of the most improved pattern. The facilities for doing the work are excellent. They use a patent measuring machine for indicating the inside and outside diameter of the tire while it is in the rolls. They depend on this machine showing within $\frac{1}{4}$ inch of the size required. They have also a patent method of keeping scale and cinder off the inside of the tire while it is being rolled. All the tires come out remarkably clean. The weight of the tires rolled varies from 600 to 1,400 pounds. There is an increasing demand for tires 4 inches thick. Mr. Atkinson says they have never had a tire break in service.

The springs made in these works are for all kinds of

railroad service. Spiral springs for freight cars are more in demand than any other form, but they were making large quantities of elliptic springs for passenger cars and different forms of locomotive springs. All springs are subjected to very severe trials in the testing machine. The elliptic springs were compressed till the two bands came together, and the spiral springs were forced solid, released and pressed solid three times. Before the test, each spring is calipered, and if it is found when tested to have settled, it is put aside to be retempered. If it sets a second time the spring is scrapped.

This company is making the Muntz car wheel, the inventor of which is superintendent of the works. The wheel has a cast-iron center and steel tire. The tire is rolled with an inside flange which acts as a retaining ring. Another thin flange, which is an extension of the inside of the tire, is sawed into webs to fit long notches cast on the inside rim of the wheel center periphery. These webs are bent over and hammered into the wheel center notches. It makes a secure fastening without bolts or rivets, and prevents the tire from turning round, should it get loose from the heating action of brake shoes.

Working of the Automatic Air Brake.

In a very pretentious book of American travel recently published, the author attempts to enlighten his readers respecting the working of the Westinghouse automatic air brake. He blunders ridiculously—does not even perceive the principle of action of the apparatus he attempts to describe to others. He says: "When the valve on the retort under each car is set in a particular way, the letting off of the straight or ordinary air brakes causes the compression of an exceedingly powerful spring on each set of brakes. If, however, you destroy the equilibrium by forcibly parting the air connection between the car and locomotive, as of course occurs when the train breaks in two, the great springs are released, and jam the brake shoes hard against the wheels, gripping them with tremendous force." If that is all the length the more intelligent class of travelers have gone in understanding the automatic brake, we need not be surprised that so many trainmen continue ignorant of the principles of its action.

A verbal description of a machine is always more or less unsatisfactory, but we shall venture a description of how the Westinghouse automatic air brake works. The brake is applied and released by levers connected with a piston working in a cylinder under each car, which we will call the brake cylinder. The piston therein is operated by compressed air stored in an auxiliary reservoir placed under each car. Carrying air in this auxiliary reservoir provides each car with an independent means of applying its own brake. The connection between the auxiliary reservoir and the brake cylinder is regulated by the triple valve. This valve is a piston and slide valve combined, the slide valve opening and shutting the passage to the brake cylinder. The upper side of the triple valve piston is open to the auxiliary reservoir, and the under side is connected with the air pipe that passes from the locomotive through the train. To release the brakes, sufficient air pressure is applied in the train pipe to push the triple valve piston to the top of its seat. In that position the slide valve part of the triple valve closes the passage to the brake cylinder, and puts the latter open to the atmosphere. When the engineer wishes to apply the brake, he permits part of the air in the train pipe to escape. The pressure in the auxiliary reservoir being then greater than the pressure in the train pipe, the triple valve piston is forced down, and the slide valve opens the passage to the brake cylinder, through which the compressed air confined in the auxiliary reservoir rushes. A large supply of compressed air is kept in the main reservoir on the locomotive, which the engineer uses to charge the train pipe with and release the brakes at will by pushing up the triple valve piston.

There are numerous minor details that need not be mentioned. The brake being kept off by the pressure maintained in the train pipe, any accident, such as the breaking of the train in two, or the fracture of the train pipe by a broken wheel, causes the brakes on the whole train to be immediately self-applied. This is the automatic principle. If anything were to happen that would detach each car from the others, the brake on each car is applied from its own supply of air, and there is no danger of the cars acting as battering rams on each other. Many accidents that would have proved appalling disasters with ordinary brakes on the cars have been rendered almost harmless by the automatic principle.

A NEWS ITEM going the rounds of the press, says that the Osabruck Steel Works have introduced the use of soaking-pits for steel tires with excellent results. Immediately after they have been rolled, the tires are carried by means of an overhead track to the pits, which are simply round holes lined with refractory brick. The claim is made that tests made on tires that have passed through the soaking-pit showed an increase of 50 per cent. in strength. That seems to us a pretty tall increase of strength, due to annealing alone. On the other hand, we have heard of steel tire makers who tried a process of annealing for tires after they were rolled, and found that it left the metal so soft that the tires crushed out of shape in service.

Standard Express Locomotive of the Grand Trunk Railway.

The engravings illustrate the standard express locomotive used on the Grand Trunk Railway for fast passenger service. It was designed by Mr. Horbert Wallis, the Mechanical Superintendent of the road, and built under his supervision at the machine shops of the company at Montreal. The engine has cylinders 18 x 26 inches, and driving wheels 78 inches in diameter.

This gives the engine a little over 100 pounds tractive power for every pound of cylinder pressure. Between the centers of drivers the distance is 8 feet 6 inches. An ordinary link valve motion is used, the valves being balanced. The outside lap is $\frac{1}{4}$ inch, inside $\frac{1}{4}$ inch. The travel of valve is $5\frac{1}{2}$ inches. The steam ports are 16 x $\frac{1}{4}$ inches and the exhaust port is 3 inches wide.

The boiler is of the straight type 50 $\frac{1}{2}$ inches diameter at smallest ring, and has 212 tubes 1 $\frac{1}{2}$ inch outside diameter. The boiler has an extension smoke-box, straight stack and raised exhaust pipe with single nozzle 4 $\frac{1}{2}$ inches diameter. The fire-box is of steel, and is 78 inches long inside, 74 inches deep from crown to bottom of mud-rig, and 35 inches wide. The fire-box is plain, with a baffle-plate above the door for deflecting air upon the surface of the fire. Great care has been taken to prevent the radiation of heat from the boiler. There is a lagging of thick silicate cloth under the jacket and an ample air space between the lagging and the hot sheet. The details and outline of this engine are designed closely after the ordinary American model. These engines are reputed to give very satisfactory results in the service for which they were designed.

Cast vs. Forged Car Axles.

It has quite recently been prophesied that the car axle of the future will be of soft steel cast in finished form. We doubt the fulfillment of this prediction, and hazard a belief that the forged car axle has a long lease of life before it. Soft steel as commonly produced is so porous and full of blow-holes that it requires a deal of work to make it suitable for use where subjected to such violent shocks and strains as in a car axle, and its use in the crude state for this purpose would be simply suicidal. The question of cost is an important one when the improved methods of making steel castings are considered. But, allowing that axles free from blow-holes or other defects could be cast by these methods, they would still in our opinion be inferior to the forged axle. Perfectly sound castings are easily had from high carbon steel, and the remarkable experience of Mr. Metcalf, of the Crescent Steel Co., with high carbon steel piston-rods for steam hammers—improving vastly more durable for that purpose than mild steel—would naturally lead one to think that high steel would be the material for axles.

The shocks to which the piston-rods of steam hammers are subjected, though manifestly much more severe, approach more nearly to those which car axles have to sustain than any we know of, and as high-carbon steel proved its ability to endure successfully the work of a steam-hammer piston, it could certainly be depended on to bear the much lighter burden of a car axle. But here arises a very grave, if not fatal, objection. It has been found in repeated instances where steel axles have been used that when the journals happen to get heated, which will occur frequently in spite of the most careful attention, the axle is rendered absolutely worthless, becomes rotten, in fact, at the spot where heated. This is explained by the fact that it required but a comparatively low temperature, no greater than is often generated by friction in car axles, to burn or oxidize high-carbon steel, and when this occurs, all acquaintance with the nature of the material can conceive the result. Of course this could not arise with an iron axle, or with steel of a non-hardening character.

It is idle for a moment to suppose that steel axles will meet with anything like general adoption so long as such serious objections as these exist against them. By the way, the prevailing practice of making axles from scrap without any rolling is anything but the best. Iron to produce a superior axle should have plenty of fiber in it, and this can only be had by rolling. Hammering scrap iron into slabs, and these into axles, breaks up what fiber was retained by the scrap, and necessarily produces an axle of inferior quality. Axles, or, in fact, forgings of any kind, are best when made from rolled iron. We had indisputable proof of this in our axle-making experience, and this evidence was by no means experimental, but extended over a considerable period of time, and covered thousands of car axles. At the works we speak of, it had been the custom to work the scrap under the hammer entirely, but, having put down a train of rolls, these, when not otherwise employed, were used for rolling scrap into bars. The marked improvement in the quality of the axles produced from these bars, though made from the same scrap as those hammered from slabs, decided the company to discontinue the manufacture of axles from slabs. They exhibited an average increase of strength of 20 per cent. The extra work which the scrap received in being rolled to bars of this size, $7 \times \frac{1}{2}$ inch, was credited with having produced this increase, but we question the correctness of this view.

Iron in the form of scrap is entirely distinct from muck

bar. The latter is improved by as high as four or five reworkings, but the latter has generally had a checkered career, and passed through so many heatings and weldings that further manipulation is needless, if not positively injurious, so that when it reaches the axle-maker's hands the quicker and easier it can be brought to the desired shape the better. Beyond a doubt the additional strength was due entirely to the fibrous structure imparted to the iron by rolling. These axles were also notably more uniform than those made from slabs, this fact being clearly shown when turning the wheel seats and journals. Those troublesome hard and soft spots, so common in the axle produced from the slab, were rarely met with, their absence insuring more accurate fits and reducing the chances for loose wheels.—*Theo. D. Morgan, in Iron Age.*

Committees of the Master Car-Builders' Association.

The following is the list of subjects and the committees appointed to report thereon at the annual meeting of the Association to be held at Niagara Falls, beginning on Tuesday, June 8, 1886:

Standard Freight Car Trucks.—Robert Miller, Michigan Central; Wm. McWood, Grand Trunk; Wm. Forsyth, Chicago, Burlington & Quincy; Joseph Wood, Pennsylvania Co.; J. N. Barr, Chicago, Milwaukee & St. Paul; Henry S. Bryan, Chicago & Iowa.

Standards and Appliances for Safety of Trainmen.—H. Hege, United States Rolling Stock Co.; John Kirby, Lake Shore & Michigan Southern; M. N. Forey, Secretary of Association, *British and Continental Practice in Matters of Interest to the Master Car-Builders' Association*.—R. S. Soule, New York, Lake Erie & Western; J. N. McWood, Grand Trunk; H. A. Whitney, Intercolonial; N. B.

Automatic Freight Car Brakes.—G. W. Rhodes, Chicago, Burlington & Quincy; Geo. Hackner, Atchison, Topeka & Santa Fe; Benj. Welch, Central Pacific; John S. Lentz, Lehigh Valley; W. T. Hildrup, Harrisburg Car Mfg. Co.

Trap Doors in Roofs of Passenger Cars.—F. D. Adams, Boston & Albany; John MacKenzie, New York, Chicago & St. Louis; Sanford Keeler, Flint & Pere Marquette; R. H. Briggs, Chesapeake, Ohio & South Western.

Standard Dead-Blocks.—Chas. Blackwell, Roanoke, Va.; G. W. Demarest, Northern Central; M. N. Forey, Secretary of Association.

Comparative Advantages of Constructing Freight Cars with or without Platform Timbers or End Sills projecting from Ends of Cars.—E. B. Wall, Pittsburgh, Cincinnati & St. Louis; B. K. Verbruyck, Chicago, Rock Island & Pacific; Geo. W. Cushing, Northern Pacific; W. H. Harrison, Baltimore & Ohio; W. F. Turf, Cleveland, Columbus, Cincinnati & Indianapolis.

Maximum Outside Dimensions of Freight Cars.—Wm. Buchanan, New York Central & Hudson River; C. A. Smith, Union Tank Line; G. C. Watrous, Detroit, Lansing & Northern.

Standard Draw-springs for Non-automatic Couplers.—Leander Garey, Hartsdale, N. Y.; W. H. Day, Wilmington, Columbia & Augusta; Allen Cooke, Chicago & Eastern Illinois.

Appliances to Prevent the Slipping of Wheels, both Passenger and Freight.—M. P. Ford, Pittsburgh, Cincinnati & St. Louis; H. Roberts, Chicago & Grand Trunk; J. P. Coulter, Ohio & Mississippi.

Committee on Revising the Height of Miller Draw-bar.—J. S. Lentz, Lehigh Valley; R. McKenna, Delaware, Lackawanna & Western.

Committee to Codify the Rules of Interchange.—R. H. Soule, New York, Lake Erie & Western; F. D. Adams, Boston & Albany; Joseph Wood, Pennsylvania Co.

Subjects to be Reported at the Next Annual Convention for Investigation and Discussion of the Succeeding Convention.—R. C. Blackall, Delaware & Hudson Canal Co.; B. K. Verbruyck, Chicago, Rock Island & Pacific; E. B. Wall, Pittsburgh, Cincinnati & St. Louis.

Committee of Arrangements for the Next Annual Convention.—J. D. McEwan, Grand Trunk; Hamilton, Canada; Leander Garey, Hartsdale, Westchester County, N. Y.

Subjects Submitted to Letter-Ballot.

Since the reorganization of the Master Car-Builders' Association, in 1882, the following subjects have been submitted to letter-ballot, and the recommendations of the association adopted by receiving the requisite two-thirds of the votes cast:

Sizes of limit gauges for round iron for the Sellers standard threads. Adopted, Nov. 1883.

Distance of $1\frac{1}{2}$ inches between the backs of flanges of car wheels. Adopted, Nov. 1883.

Double dead-blocks to be $1\frac{1}{2}$ inch apart, 2 $\frac{1}{2}$ inches between centers, 8 square on face and 6 inch thick. Single blocks to be not less than 20 inch long, 7 inch thick and 8 inch deep, measured vertically. Adopted, July 1884.

Diameter of Master Car-Builders' standard axle to be $4\frac{1}{4}$ inch in the middle, instead of 3 $\frac{1}{2}$ inch. Adopted, July 1884.

System of lettering and numbering Freight Line box cars. Adopted, July 1884.

Limit of variation of $\frac{1}{4}$ inch each way from the standard distance of $4\frac{1}{2}$ inches between the backs of flanges of car wheels. Adopted, Sept. 1885.

The following subjects have also been submitted to the letter-ballot, but failed to receive the necessary two-thirds vote:

Form and section of flanges and treads for chilled iron car wheels, Nov. 1883. Not adopted.

Form and section of flanges and treads for steel-tired car wheels, Nov. 1883. Not adopted.

System of lettering and numbering box cars not in Freight Line service, July 1884. Not adopted.

Form and section of flanges and treads for both iron and steel-tired car wheels, Sept. 1885. Not adopted.

The Christie brake-shoe and head, and the Collin brake-shoe and head, Oct. 1885. Not adopted.

New Locomotives for the Union Pacific.

The Union Pacific Railway Company have recently ordered 15 eight-wheel locomotives from the Brooks Locomotive Works, the engines to be built according to drawings and specifications furnished by the company. The engines have cylinders 18 x 26 in., the driving wheels being 63 in. diameter outside of tires. The boilers will carry 150 pounds steam pressure, with a mean cylinder pressure of 130 pounds, which ought to be easily maintained. In full gear the engine will exert upward of 17,000 pounds to slip the wheels. As the weight on the driving

wheels is only about 60,000 pounds, it looks as if the engines would do a good deal of slipping. The steam ports are 16 x $\frac{1}{4}$ in., exhaust port 16 x $\frac{1}{4}$ in. The guides are of the two-bar variety, of the style used on class K engines of the Pennsylvania Railroad. Steel is used largely in the construction of these engines. The boiler shell and part of the fire-box are of that material, and the driving axles, crank-pins, piston-rods, cross-heads, main rods, side rods, equalizers and various other parts are also of steel.

The boiler is of the wagon top style, with dome placed above the fire-box. The boiler is 55 inches diameter at smallest ring, and is made of $\frac{1}{2}$ -inch sheet, riveted with $\frac{1}{2}$ -in. iron rivets, cylindrical courses, one plate each, with horizontal seams placed above water line; horizontal and waist connection seams double riveted; all horizontal seams in addition to have a welt.

The fire-box is 34 in. wide and 72 in. long at bottom of water-leg. The side and back sheets are copper, $\frac{1}{4}$ in. thick; crown sheet is steel, $\frac{1}{2}$ in. thick, and the tube sheets are steel $\frac{1}{2}$ in. thick. The stay-bolts are refined iron, $\frac{1}{2}$ in. diameter, placed $\frac{1}{2}$ between centers. The crown sheet is supported by bars. An extension front and open stack are used. All the most approved appliances for the convenient and economical operating of the engine are provided.

New England Railroad Club.

The regular monthly meeting was held on Wednesday evening, April 14, Mr. Lauder in the chair.

The subject for consideration was the proper variation that is admissible between the flanges of wheels that are run on New England roads.

A number of replies were received to a circular sent out by the Secretary as to what should be the rejecting limit of gauge of wheels now in service. The replies report the maximum and minimum gauge between flanges upon 19 roads, including the Grand Trunk, Chicago, Burlington & Quincy; Lake Shore, Lehigh Valley and Illinois Central, as follows:

	Maximum.	Minimum.
9 roads (New England).....	4 ft. 5 $\frac{1}{2}$ in.	4 ft. 4 $\frac{1}{2}$ in.
1 road.....	4 ft. 5 $\frac{1}{2}$ in.	4 ft. 5 in.
2 roads.....	4 ft. 5 $\frac{1}{2}$ in.	4 ft. 5 $\frac{1}{2}$ in.
4 roads.....	4 ft. 5 $\frac{1}{2}$ in.	4 ft. 5 in.
1 road.....	4 ft. 5 $\frac{1}{2}$ in.	4 ft. 5 in.
1 road.....	4 ft. 5 $\frac{1}{2}$ in.	4 ft. 5 $\frac{1}{2}$ in.
1 road.....	4 ft. 6 in.	4 ft. 5 in.

After some discussion, the following resolution, moved by Mr. Chamberlain, of the Providence & Worcester road, was adopted:

Resolved, That the standard distance between wheel flanges as adopted by the Master Car-Builders' Association, of 4 ft. 5 $\frac{1}{2}$ in., with a limit of $\frac{1}{2}$ in. each way, be indorsed by this club, for driving wheels; and that an inspectors' limit be established of a minimum distance of 4 ft. 4 $\frac{1}{2}$ in., and a maximum distance of 4 ft. 5 $\frac{1}{2}$ in.

The committee appointed to entertain the Master Mechanics' Association at the forthcoming convention at Boston was announced as follows: John Kent, Charles W. Sherburne, George W. Peck, A. G. Barber and Joel H. Hills.

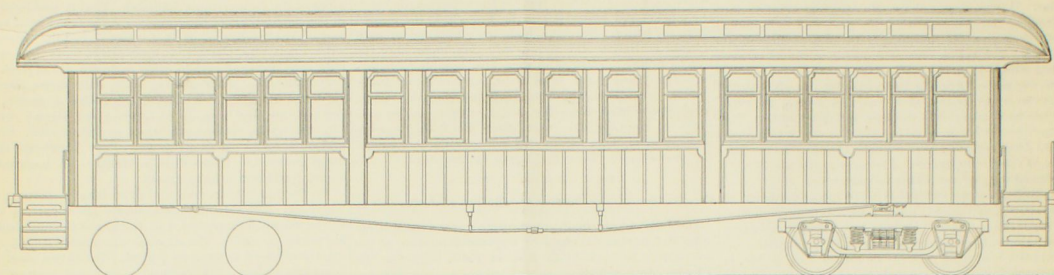
Apparatus for Operating Brakes and Car Couplings.

One of the most ingenious elaborations of mechanism we have ever examined, is an apparatus for operating railway trains, invented and patented by Bernard Frese, of Chicago. The inventor is a working jeweller, and he has devoted much time, patient labor and great skill in constructing a working model of his invention. The inventor has produced a continuous brake of his own, which he operates from the engine, and he has also an automatic car coupler operated from the same place, and in such a way that the services of brakemen and switchmen will be dispensed with. His claim covers the necessary mechanism by which the various operations pertaining to the braking and coupling of cars can be performed by a single person located at any designated point on the train, to enable any one or all of the brakes of the train to be applied, either independently or as desired, and to enable the engineer to determine the distance the car to be coupled is from the moving train, and to uncouple at a station such cars as are to be left at the station, and to keep a record of the location of the different cars in the train.

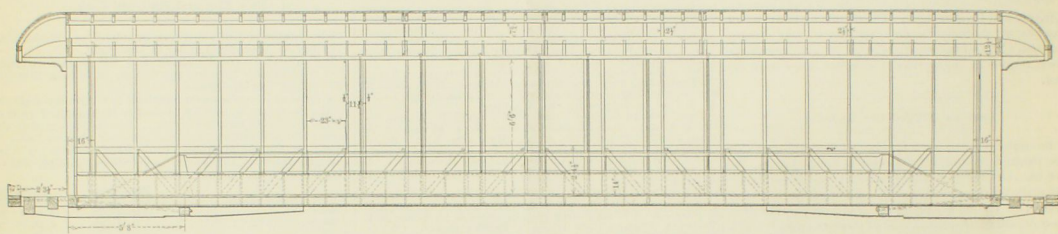
The work of braking and coupling is done by two rods passing from the engine throughout the train. These rods are revolved by power on the engine. They apply or release the brakes by means of gear-wheels operating the brake levers. By means of clutches that change their action, the rods can be made to operate the coupling mechanism, which consists of a bell-mouthed draw-head and a complex arrangement of cogs, levers, catches and springs. The details of the apparatus are designed with great ingenuity and worked out with undoubted skill, but an insurmountable drawback is that the complex machinery could never be kept together in the service railroad cars are subjected to. The invention calls for more machinery under each car than there is about a locomotive.

A SWITCHING locomotive has recently been built at the Chicago, Burlington & Quincy shops, at Aurora, with the reverse lever on the left-hand side. The engine is intended for work in one end of the Aurora yards where there is a curve, and the object of placing the reverse lever on the left-hand side is to enable the engineer to take signals from that side, which is inside the curve.

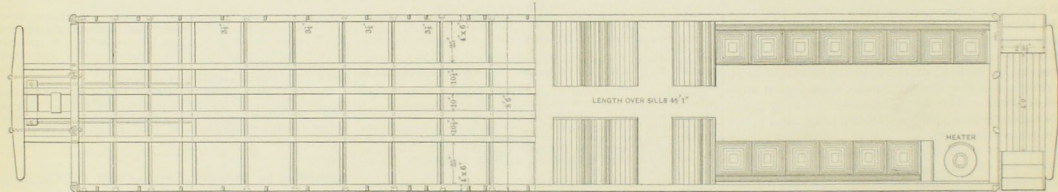
STANDARD SUBURBAN PASSENGER CAR—ILLINOIS CENTRAL RAILROAD.



Side Elevation.



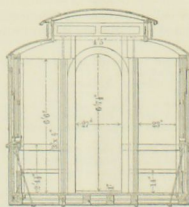
Longitudinal Section.



Floor Frame.

Plan of Seats.

This style of car is used for the heavy suburban passenger traffic of the Illinois Central Railroad Company, and is regarded as highly successful in every way. The weight of the body of the car is 19,800 pounds, and the trucks weigh 11,920 pounds, giving a total weight of 31,720 pounds. The cars carry 54 passengers, so that each passenger is carried on a dead weight of 587 pounds. Although the proportion of dead weight is small, the cars are very substantially built, great care being exercised to place the material so that strength and lightness are combined. The extreme length over sills is 45 ft. 1 in.; width, 8 ft. 6 in.; height from rail to bottom of sills, 3 ft. 7 in.; height from rail to eaves, 10 ft. 6 in.; height from rail to top of roof at center, 12 ft. 11 in. The length of the car inside is 44 ft. 4 in.; width, 7 ft. 10 1/2 in.; height from floor to ceiling at side, 6 ft. 2 in.; height from floor to ceiling at center, 8 ft. 7 in. The seats are Hale & Kilburn's rattan. There are 12 double in cross section, and 90 single at sides. The interior finish of the car is oak panels and mahogany veneers. The roof is the raised bull-nose. The car is warmed by Searles heaters. The trucks are 4-wheel yoke with wooden frames. The diameter of the wheels is 33 in., and the journals are 3 1/2 x 6 in., wheel base 66 in. Triple elliptic springs 35 in. long are used.



Transverse Section.

of loose grit flying round. Then it was found that the engine truck, through some mistake in preparing for change of gauge, had been left with an unusual amount of lateral play. The inference then drawn was that the lateral motion gave too great an absorbing surface for the flying sand, which caused the bearings to run hot. New brasses, made to cover all the journal, stopped the trouble and exploded the mystery.

A PECULIAR experience was had with a locomotive on the Cincinnati, New Orleans & Texas Railway lately. An engine truck would always get hot when running over a certain stretch of track. The train men came to regard the matter as very mysterious, for the bearings would cool off so soon as the piece of track was passed, and the heating happened when running in both directions. The case puzzled the engineer and round-house foreman, and was becoming the talk of the road, when it reached the ears of Mr. Meehan, superintendent of motive power. He ridiculed the "mystery," and ordered an investigation of the "cause" of the trouble. It was found, in the first place, that the track where the heating took place had been recently surfaced up with sand, and there was a good deal

"DELTA metal," says the Mechanical Engineer, "is now being used by a leading continental railway company for the entire exterior structure of railway carriages. Great difficulty is experienced by carriage builders in the use of iron and steel for this purpose, on account of these metals rusting so rapidly, and the carriages thus requiring frequent repainting, which is, of course, expensive, and it being impossible to paint the inside, they deteriorate very rapidly from the condensation of water; but in the use of Delta metal by the railway company above referred to, the said difficulties are completely overcome; the cost at the outset is a little more, but the after saving more than makes up for it. The Southeastern Railway Company's

recent experiment with silver-plated cars is a great improvement, but the expense is much heavier than steel iron, or even Delta carriages."

THE undernoted report is the form of a notice posted up monthly on a Northwestern railroad to inform trainmen of punishments for dereliction of duty and the nature of the offences:

Conductors.	Enginemen.	Firemen.	Act's and Oper's.	Brakemen.	
1	1	1	1	1	Hauling loaded cars as empty.
1	1	1	1	1	Not displaying proper signals.
1	1	1	1	1	Not picking up loads.
1	1	1	1	1	Hauling cars on wrong bills.
1	1	1	1	1	Colliding with cars on side track.
1	1	1	1	1	Failing to protect rear end of train.
1	1	1	1	1	Fast running through stations.
1	1	1	1	1	Noisy conduct.
1	1	1	1	1	Breaking draw-bars.
1	1	1	1	1	Failing to observe signals.
1	1	1	1	1	Refusing to check car merchandise.
1	1	1	1	1	Damaging cars while coupling.
1	1	1	1	1	Using insulting language to passenger.
1	1	1	1	1	Drunkness.
1	1	1	1	1	Leaving switch wrong.
1	1	1	1	1	Throwing switch wrong.
1	1	1	1	1	Not on hand to go out on train.
1	1	1	1	1	Failure to know cars on side track.

A BILL is pending in the Iowa Legislature to permit railroad companies in that State to condemn land alongside the track, so that it may be taken for the purpose of erecting snow fences where they are necessary. Some farmers of a money-making disposition annually force large sums out of railroad companies for the privilege of putting snow fences on part of their land during the winter. The railroad companies are tired of paying the whole value of farms for this privilege, hence the introduction of the bill alluded to.

Locomotive Draft Appliances.

BY ANOUS SINCLAIR.

EXHAUST STEAM FOR CREATING DRAFT.

It is now generally admitted that the emission of the exhaust steam through the smoke-stack of a locomotive is the most simple and efficient method of producing the strong artificial draft necessary to generate steam in the boiler with the rapidity it is used in locomotive cylinders. That the steam blast was the best for this purpose was not, however, admitted or settled without thorough trials of other methods. There is considerable conflict of testimony as to who first applied the exhaust steam to the creating of an artificial draft in the chimney of a locomotive; but it is certain that the practice was followed with the crude locomotives used on the coal railways opened in the north of England before railways were introduced for general traffic, and it was applied to some extent before the railway era, on small steamers plying on American waters. Some writers would lead us to believe that the beauty and utility of the steam blast struck the world as a revelation the first day it was tried, and that the whole engineering fraternity was captivated with its efficiency as an aid to rapid steam making; but there is good reason to believe that the unanimity of admiration was not so perfect as represented.

THE FAN AGAINST THE STEAM BLAST.

Although the steam blast had been in use more or less in England for ten years before the time of the competition of locomotives for the Liverpool & Manchester Railway, in the locomotive built for that competition by Captain Ericsson, artificial draft was maintained by forcing air through the grates by means of a fan. The various metallurgical operations made engineers very familiar with this method of forcing the fire, and it was natural that many able men should regard the fan as the proper way of creating the violent artificial draft required in a locomotive boiler.

About the time English engineers were designing locomotives for the Liverpool & Manchester Railway, Mr. Peter Cooper, in Baltimore, was building his tiny "Tom Thumb" locomotive, that was destined to demonstrate that the steam engine could be applied successfully to operate the curved track of the Baltimore & Ohio Railroad. Cooper adopted the fan to maintain a forced draft through the grates, and when Phineas Davis designed larger locomotives for practical use on the Baltimore & Ohio road, he also preferred the forced air system. It was thoroughly tried on the road named, and for a time held its own against the steam blast adopted on other railroads, and the fan was only abandoned when the able engineers of that road became convinced that the steam blast gave better results.

TRIUMPH OF THE STEAM BLAST IN AMERICA.

The first locomotive constructed in America for regular service on a railroad was the "Best Friend of Charleston," built at West Point Foundry, New York, in 1830. This engine had an upright boiler, and the exhaust steam wasted from the cylinders to the smoke-stack, where its passage to the atmosphere created a draft. The designer of this engine, Mr. E. L. Miller, had visited England and watched the operations of the locomotives pulling coal trains on the Stockton & Darlington Railway, so he probably brought from thence the idea of utilizing the exhaust steam to create draft. But it was by no means a novelty to American engineers acquainted with steamboat practice. To apply the steam blast to the locomotives they built became the recognized practice of the West Point Foundry, and their methods exercised no small influence on early American railroad machinery. The locomotives that were imported for early roads all used the steam blast, and it came to pass that all American locomotives used it except those on the Baltimore & Ohio Railroad. When the latter corporation fell into line, all American roads recognized the steam blast as an essential feature of the locomotive. Many isolated attempts have been made to revive the fan since it was abandoned by the Baltimore & Ohio road, but all have resulted in failure.

DUTY OF THE STEAM BLAST.

A very common consumption of coal in the fire-box of an American locomotive is 30 pounds per minute. The combustion of each pound of coal requires the supply of about 20 pounds of atmospheric air, which is equivalent to 260 cubic feet. This entails the passage through the grates of $260 \times 30 = 7,800$ cubic feet of air per minute. To produce a draft that will supply this quantity of air is the function of the steam blast. If a draft is too weak to supply the required quantity of air, there will not be sufficient steam made to do the work; if the supply of air is too great heat will be wasted.

The varying moods of train requirements are constantly changing. At one minute the fire will be burning coal at the rate of 40 pounds per minute. Two minutes afterwards the requirements of steam making may have reduced the coal consumption to 5 pounds per minute. An admirable feature about a well designed steam exhaust is, that it changes automatically its capacity to supply the air for combustion in unison with the change that reduces or increases the demand for steam.

Besides being extremely efficient in its action, the steam blast is a remarkably simple arrangement, with few parts

to get out of order. The severe jolting to which every part of a locomotive is constantly subjected precludes the use of draft appliances that will not endure rough treatment without constant failure.

ACTION OF THE EXHAUST IN CREATING DRAFT.

The front ends of the flue tubes leading from the fire-box find an outlet in the smoke-box, an apartment made large or small as circumstances, taste, fashion or prejudice dictate. The door of the smoke-box ought to be perfectly air tight, and the only aperture of egress the smoke-stack. Artificial draft is created by the steam blast in the smoke-box, the exhaust pipe opening being placed central or nearly so with the axis of the stack. When the engine is at work, the exhaust steam passes rapidly through the stack, the velocity depending on the pressure of the steam released and the size of the nozzle opening it has to pass through. The greater the quantity of steam passing through the cylinders, the greater, under ordinary circumstances, will be the draft induced.

Draft by the exhaust steam passing from the exhaust pipe through the smoke-stack appears to be created in two ways. The steam partly acts on the surrounding air or gas it passes through to induce a current by friction of the particles; or, on the other hand, its compact volume fills the smoke-stack like a piston, in forcing draft by leaving a partial vacuum behind like the action of a pump plunger. Whether the current be induced by friction or by the piston-like action, the air in the smoke-box is rarified, and there being only one means of ingress to fill the partial void, the pressure of the atmosphere forces air through the grates into the fire in its passage to the smoke-box by way of the tubes.

Inducing a current by friction is the principle the steam jet works on, and when that is the mode of the exhaust action in maintaining draft, the nozzle is merely an enlarged jet opening. There is no doubt that when the exhaust steam acts like a plunger in the smoke-stack to leave a partial vacuum behind, a more perfect draft can be maintained with the same steam velocity, than where the draft is created by friction; yet the latter practice of draft induction is largely followed with American locomotives. In ordinary working at moderately high piston speed, the exhaust acts in both ways. At low speed the plunger action alone ought to provide the required draft.

Under whatever conditions a locomotive is worked, the degree of draft created by a given volume or velocity of exhaust steam will depend to a great extent upon the way the nozzle or nozzles and their connections pass the steam into the stack. If the steam passes centrally into the stack in a compact form, and expands on its passage just enough to fill the stack at its base, a low tension of exhaust steam will serve to leave a comparatively high vacuum behind. If the smoke-box is air-tight, this vacuum will instantly be filled by the gases that pass through the tubes, and it will be possible to make the engine steam with large exhaust nozzles. This perfect action of the exhaust steam in creating draft is not so often found in practice as it ought to be. One engine has her nozzles or petticoat pipe set so that the steam strikes on the side of the stack, the consequence being that it straggles out into the atmosphere a broken column; another engine has the nozzle, nozzles or petticoat pipe set central, but the steam is delivered in such a shape that its volume does not fill the stack till it is near the top, so that the piston action does not commence till the steam is beginning to pass into the atmosphere; still another engine, owing to imperfectly adjusted appliances, permits the volume of the exhaust steam to expand so much before reaching the stack that part of the steam strikes outside the stack opening, and projects straggling steam into the smoke-box space. In all these cases defective draft results from the mal-adjustment of parts. The usual remedy is contracting the nozzles so that increased velocity of steam may overcome the defects, and by the method of friction induce sufficient draft for steam making purposes.

THE MEN WHO HANDLE DRAFT APPLIANCES.

There are few parts about a locomotive that exert more direct influence for good or evil, for saving or waste of heat, than the draft appliances; yet the fitting and adjustment of these parts are generally left to cheap labor of the kind that is supposed to be paid poorly for doing disagreeable, dirty work, that requires no skill to execute or brains to plan. It is not surprising, then, that in many shops the smoke-box work is done in a shiftless, perfunctory fashion. It is almost incredible, however, the number of locomotives built in first-class shops and running on first-class roads, that have their nozzles out of line with the center of the stack. The belief is prevalent among locomotive men, that no two engines can be built that will steam and work alike, although every part may be made from interchangeable templates. There is good reason for believing that the difference perceived in locomotives of the same class, is due in many instances to the mal-adjustment of draft appliances.

CURIOUS DIFFERENCE IN THE PERFORMANCE OF TWO LOCOMOTIVES.

The writer once investigated the difference between two locomotives that brought this out very clearly. Two engines were running opposite each other on the same service. They were of the same size in every particular, and were built at the same time in a shop noted for the accurate interchangeability of its work. Yet one of the loco-

motives steamed more freely than the other, and was supposed to pull better. The free steamer could always be worked with a light fire, but the other engine steamed most freely with a heavy fire. It made no difference who was running or firing the engines; these peculiarities were always apparent. The free-steaming engine was considerably lighter on coal than the other. After patient searching for the cause of the difference in the two engines, we found that the exhaust pipe of one of them was set slightly out of line. The obliquity was so small that it was overlooked in several searches, but was eventually discovered. After the defect was corrected, no difference could be perceived in the working of the two engines.

PETTICOAT PIPE AND ITS CONNECTIONS.

The influence on the steaming qualities and coal-devouring propensities of a locomotive that a slight change in nozzles, petticoat pipe, diaphragm plate, smoke-stack, cone, angle or size of diamond makes, is vividly familiar to thoughtful men who run locomotives; yet in too many instances the officers in charge ignore the importance of having these parts of proper size, shape and adjustment.

Where low nozzles are used, a petticoat pipe must intervene to convey the steam centrally to the stack. With this combination the size and shape of the petticoat pipe must be adapted to size of nozzles, diameter of stack and height of smoke-box. In addition to leading the exhaust steam as straight as may be to the stack, the petticoat pipe has proved a fairly efficient means of equalizing the draft through the different rows of flues. This prevents the flues from getting choked up with cinders. There is a certain position where a petticoat pipe will give the best steaming results, and a very small change from that position will affect the steaming qualities injuriously. If a vacuum gauge be applied to the smoke-box, it will be found that the position that causes the engine to steam most freely is the position where the highest vacuum is created. The smoke-box vacuum is affected very readily by raising or lowering the bottom of the petticoat pipe, but when the latter has a sleeve that can increase or decrease the distance between the top of petticoat pipe and bottom of stack, it is found that considerable change has to be made to affect the vacuum.

The difference of an inch or two in the diameter of the smoke-stack is of little consequence with a diamond stack, so long as the petticoat pipe harmonizes in its proportions with the stack.

CONE AND DIAMOND STACK.

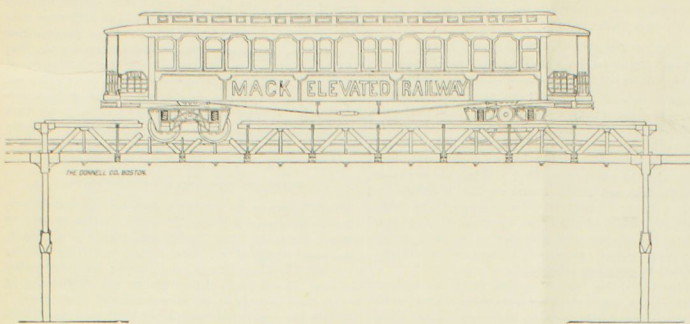
The size and shape of the cone and its attachments make a material difference in the steaming qualities of a locomotive, but it is a case of great or small obstruction to the draft. The tendency of the day is to improve the cone by abolishing it altogether, but where that remedy is not in order, it should be constructed and set so the gases will not rebound into the cylindrical part of the stack after striking the cone. Where the cone is low set, this is liable to happen, and the lower angle of the diamond being formed flat, has a tendency to project the gases downward.

(To be continued.)

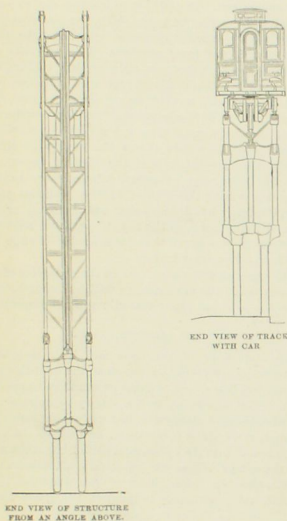
A Mechanical Fallacy.

The persevering inventor who labors persistently to make railroad officers take stock in a mechanical fallacy is not confined to America, although his name is legion here, as most railroad men can testify. There is an inventor in France who believes that train resistance can be greatly reduced by increasing the size of wheels, and he has labored for years to convince railway officers that his theories are correct. Being a man of means, he has had a locomotive and train of cars built embodying his ideas, and they will be tried shortly on the Southern Railway of France. The locomotive has three pairs of coupled wheels 8 ft. 2½ in. diameter. The cylinders are 19 × 38 in., and the engine in working order weighs 45 tons. The cars are carried by four wheels of the same diameter as the locomotive drivers, the total rigid wheel base being 15 feet. The great height of axles and wheels necessitates a peculiar construction of car, and he arranges the seats in two stories. There are lower compartments at the ends and between the wheels, and an upper compartment which is reached by outer stair cases. It will take some courage to ride on this train at the high speed the inventor expects to make. Independently of the danger arising from the high center of gravity, combined with the long, rigid wheel base, the inventor has evidently mistaken the nature of the obstacles to high speed, among which axle friction cannot be reckoned. The power required to overcome this increases in the simple ratio of the speed, while the air and other resistances increase as the square or cube of the velocity. And although the power required increases, the work consumed in axle friction does not; for a given distance, the axle makes the same number of revolutions whether the train moves slowly or fast, and if the steam is as economically got up and used in one case as the other, the portion of the cost falling upon the axle friction is the same in both cases. If there were no other resistances, high speeds would be more economical than low ones, as the plant would be better utilized; but, practically, the reverse is the case.

THE MACK ELEVATED RAILWAY



Side View of Track with Car



A model of the structure shown in the cuts has been exhibited at the Grand Pacific Hotel, in Chicago, where it attracted considerable attention from railroad men and others interested in systems of rapid transit for cities.

The structure consists of side lattice girders and a middle stringer, the latter being below the level of the top of the side girder.

The intention is to carry the weight of the rolling stock principally upon the middle rail, the middle wheels of the truck having double flanges. The truck has also a pair of side wheels which run on top of the side girders, but the purpose of these wheels is said to be principally for steadying the car in passing curves. The model track has a curve representing a curve of 45 feet radius, and the car goes round it with remarkably small resistance. Mr. Mack claims that the form of truck used for his road will greatly diminish the train resistance, since the arrangement of the wheels makes the truck act like a velocipede. The details of construction of the trucks are admirably worked out. The leading points of superiority which the inventor claims for this style of elevated road are as follows:

The structure is symmetrical, and offers almost no hindrance to street traffic.

Where streets are narrow, as in the principal thoroughfares of Boston, the structure can be built upon the sidewalk and will then occupy little more space than an ordinary street lamp-post. The lower pillars shown in the smaller diagram, represent 9-inch columns, set 2 feet apart and standing 8 feet or more from the sidewalk level, so that they do not necessarily occupy more than 3 feet 6 inches from the curb inward on the sidewalk, while the space between the pillars will admit of pedestrians passing between them without inconvenience.

Where streets are wide, it can be built to straddle the ordinary horse car lines at a proportionately lower cost, having only single columns of a larger diameter on either side of the horse car track, thereby minimizing the objection to such a structure in streets used for residences.

There being no cross-ties on the top of the trestle, obstruction to light in stores and warehouses is reduced to a minimum.

The cars to be used do not require any special construction, those in use on any of the New York roads being perfectly suitable when placed upon the trucks built for this system.

There is also no danger of cars jumping the track, the greater part of the weight resting on the central rail, which is placed on a much lower plane than the side rails. The structure is adapted to steam, electric or cable power, is economical in cost, and offers a minimum of obstruction to light in buildings and ordinary street traffic.

Railway Car Couplings in England.

Engineering of April 9 contains the following in regard to a competitive trial of couplings under the auspices of a trades union society, and the award of prizes to the successful competitors:

The competition of railway couplings for the prizes offered by the Amalgamated Society of Railway Servants took place on the first three days of last week at the Nine Elms goods yard of the London & South-Western Railway Co., who afforded every possible facility to the exhibition, and the many visitors from lines in all parts of the kingdom. The preliminary trials took place on the first two days, and the number of competitors reduced to seven or eight, who came up for a final examination on Wednesday. The result was that the jurors awarded, in the class of non-automatic couplings, the first prize of £100 to Messrs. Younghusband & Hudson, Darlington; the second prize of £50 to W. Hill, Stoke-on-Trent; and the third prize of £25 to W. Cook, Jr., Glasgow. The jurors awarded, in the class of automatic couplings, the first prize of £100 to Darling's Automatic Railway Coupling Co., Glasgow; the second prize of £50 to Latham Brothers, Sheffield; and the third prize of £25 to La Compagnie des Appareils Automatiques, Paris. It is exceedingly gratifying to find a trades union applying itself and its funds to such a useful and beneficent purpose as discovering means to save the lives and limbs of its servants. A great deal of ingenuity has been exercised upon the production of couplings which can be joined without the shunter going between the vehicles, and if it could be shown that a really efficient and practical appliance were in existence, the force of public opinion would be brought to bear on the companies to insure its adoption. Up to the present they could plead with sincerity that nothing of a reasonable price and universal applicability was to be had. But if it is known that the efforts of inventors will be backed by the moral influence of the railway servants, inventors will be stimulated, and if they succeed in winning the approval of the men whose lives are at risk, the public will endorse the verdict most emphatically, and the more so as they have hitherto chiefly had the less pleasant side of the action of the trades unions brought before their notice. We trust the example set by the railway servants will gain many imitators. There are plenty of dangerous and unhealthy occupations which might be greatly ameliorated by very simple means, if inventors of limited means had the encouragement of a little pecuniary assistance held out to them in the shape of prizes.

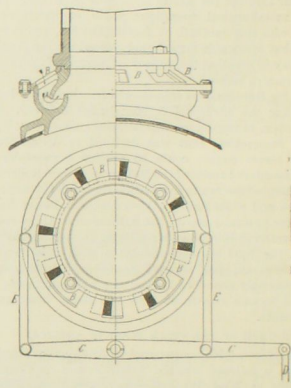
A Model Coaling Station.

The coaling station connected with the new machine shops recently built by the Pittsburgh, Cincinnati & St. Louis Railroad Company, at Columbus, O., is operated by machinery specially designed for the work in the office of Mr. Wall, superintendent of motive power. It consists of an overhead traveling crane of ten tons capacity, which runs on a track on top of a large trestle, 24 ft. high, 400 ft. long, and distance between tracks 50 ft. This trestle is built of very heavy oak timbers. Below and at the sides are the coal tracks where the coal is brought in as needed. The traveling crane consists of a bridge of two wrought-iron girders connected at each end by a two-wheeled truck with double flanged wheels and double chilled treads. Power is communicated to a drum which is geared to the main shaft of the engine. To this engine is attached a boiler which is sheltered by a cab in which the engineer or operator of this peculiar engine controls the movements of the crane and the raising and lowering of the coal buckets. Convenient to the engineer's hand are three levers, by which he is enabled to raise the bridge or car to travel longitudinally in either direction across the bridge, or he can raise or lower the

load at will. The bridge and lifting arrangements may be moved singly or simultaneously as desired. This crane leaves the space below and between the trestles perfectly clear, so that an engine can go underneath the buckets containing the coal, be lifted up at the side and then moved over to the track where the engine stands, and the coal dumped into the tender.

The buckets spoken of are twelve in number, six feet in diameter and four feet high. They are made of $\frac{1}{2}$ -inch boiler iron, and have from two to two and a half tons capacity. These buckets are wonderful pieces of mechanism in themselves. They have four iron handles which join in the center so that the block hook of the traveling crane can grip the bucket in either direction. Each bucket has four 10-inch wheels. In the center of each bucket are two trap doors held in position by clutch hooks, so that when the bucket is full and in position above the tender, the operator has but to touch the lever and the coal is dumped into place. When the buckets are lowered for refilling, the trap-doors, which have rollers on them, close automatically when the bucket strikes the platform, which is located close to the cars filled with coal. The weight of the bucket brings the doors together, when they are caught and held in a clutch that catches in gauges in the hangers, locking them until tipped as above explained.

In connection with this crane is a scale, which indicates the pounds of coal in each bucket, and by which an accurate account of all coal loaded can be kept. The engineer in his cab in the crane, controls, weighs, loads and unloads the coal. By this method the work is done by half the men usually employed at coal stations.



Improved Locomotive Damper

The cut illustrates an improved locomotive damper recently patented by Mr. H. A. Luttgens, of Paterson, N. J., and which has been applied by the Rogers Locomotive Works to several engines of their construction, with the most satisfactory results.

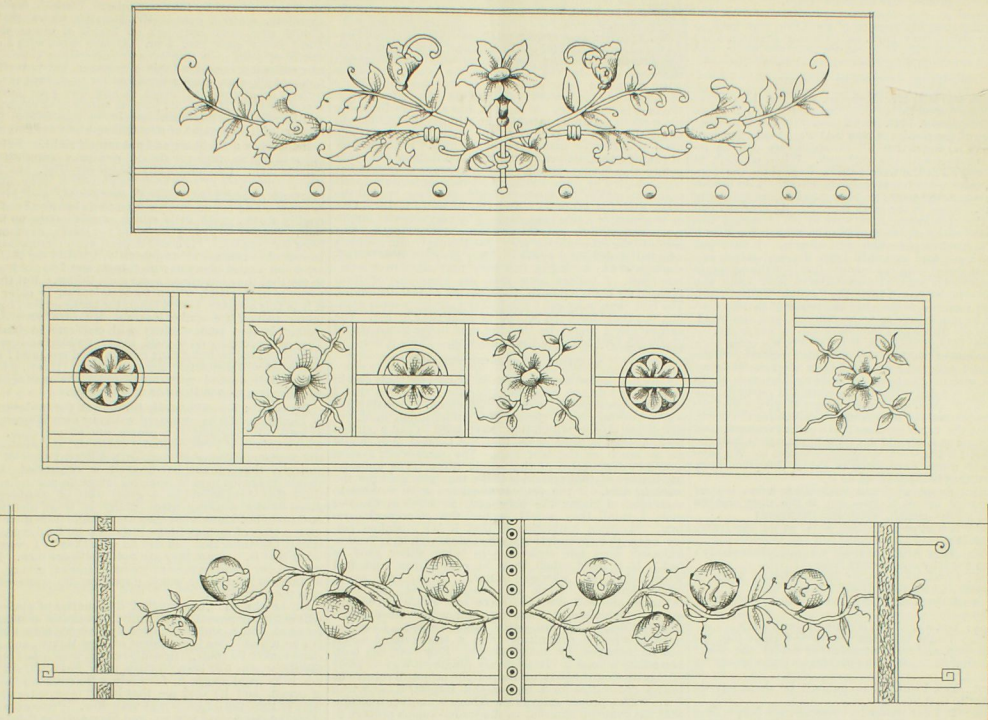
The damper is formed at the bottom of the stack. It takes the place of the ordinary base, and can be applied to every style of locomotive stack. The engineer, by operating a plain rod *D* with handle placed within the cab, can moderate the effect of the exhaust steam upon the fire by rotating the circular valve *B* (preferably made of brass) placed over apertures which it covers or uncovers, and which communicate with the inside of the stack. The direction of the current of air is indicated by the arrows *A*. The pressure of the steam, and to a certain extent, the condition of the fire, can, by means of this device be brought under the immediate control of the engineer.

It has also proved to be a very effective spark arrester, preventing the issue of sparks and flame at the top of the stack when fresh coal is thrown upon the fire, or when the engine is worked to the full extent of its power.

When a coal fire is supplied with sufficient air for combustion, it develops a heat of about 4,900°. When a greater quantity of air is admitted the heat is diminished, and with double the quantity it is reduced to 2,550°, so that it is found in practice that the damper produces a very appreciable saving in fuel, and obviates the necessity of admitting cold air upon the heated fire-box and into the flues of the boiler through an open fire door.

The illustration shows it to be of very simple construction, and it is so easily operated that it meets with no objection from the engineer.

The *London Railway Review*, a weekly paper devoted to advocating the cause of British railway employees, keeps a standing notice requesting railway men to send for publication particulars of train brake failures. By exposing the frequent failures of defective brakes, the railway employees expect to be able to compel railway companies to abandon brakes that habitually fail when applied.



DECORATIVE DESIGNS TO GO OVER WINDOWS INSIDE OF STREET CARS.

Drawn by E. W. Selkirk, Albany, N. Y.

A New Kink in Passenger Train Service.

A St. Louis man has invented a method of taking up and discharging passengers from railway trains while in motion. It is thus described:

The working model and drawings show a main track on the level and an elevated track in front of an elevated depot with inclined tracks leading to it. The idea is to start a train from one terminus and not to have it stop or slacken speed until it reaches the other end. At the same time passengers may be taken up and discharged at any station. As a train reaches a station on the main track the rear car switches off and runs up the inclined plane to the elevated depot. At the same time another car runs down the other inclined plane, is caught by the passing train, whirled on to the main track and becomes a part of the train. The passengers who desire to stop at the next station pass to the rear car, which was side-tracked, as was the previous one, and another car load of passengers is taken on. By a very simple contrivance, which acts automatically when a train gets within a certain distance of a depot it releases the car in waiting, which starts down the inclined plane just as the last car of the train is switched off and starts up on the other side. This transfer of cars is made without jerking or danger of derailling, and the passengers would not be aware of the operation of coupling and uncoupling. There are quite a number of details which are remarkably interesting, and all form a system which is apparently perfect. The model works without a hitch.

Do You Remember,

Not many years ago, when a journey that must be taken would loom up as a nightmare, as something to be dreaded? It was in the days when through cars were not; it was then we boarded the cars with no further knowledge than that we could get there, when the train did; it was then we changed cars early and late, and at midnight, as a matter of course, and swore not, because we knew no better.

It was then considered big luck to get an entire seat to one's self, and a good night's rest curled up thereon, if the conductor did not call for tickets more than eight times during the night, and when the morning came to bathe one's face with the dampened corner of a handkerchief completed the toilet. There were no toilet rooms for ladies to lock themselves in again at all the others, and there were no fights in those days. If the train stopped twenty minutes for dinner it was a treat, and it was a well-regulated and much-traveled railway where the natives came around the station to sell pies and things.

But it's different now, the passenger is somewhat spoiled, so to speak. He is prone to look upon an intended journey as a picnic, and wants to know the minutest particu-

lars, when the train will arrive, and the route he goes must have no change, the car he rides in must go all the way, no matter where, and a midnight change is worse than walking. Coaches are not good enough for even a daylight ride; there must be a parlor car for the tourist aristocrat, and at night he must be as comfortably bestowed as if at home, and oftentimes more so. He is not content with a berth, but must have a compartment to himself. It must be as clouds are said to be, with a silver lining. It must be a boudoir—a man's boudoir will do, but it must be as dainty in its fittings as a lady's, and there must be a toilet with hot and cold water to accompany this boudoir, and very soon there must be a bath and a barber, now that he has got all the rest in this boudoir car. And there must be later on, a toilet in each room, so the ladies, bless 'em, can lock their pretty selves in, and stay till the train stops, just as they do now, but then without inconveniencing each other.—*E. W.*

A Second "Pullman."

The Buffalo Express says: "A second Pullman, will soon rear its head if the signs do not fail, at East Buffalo, where the New York Central Sleeping Car Co. is about to build shops. The company has in service about 400 cars and in building at East Buffalo has arranged for facilities for the construction of 80 cars at a time. The extent of the work which it intends to do is shown in the fact that it will employ 1,600 to 2,000 mechanics. The contract for the erection of the buildings has been awarded to Mr. W. R. Havens, who built the West Shore shops, of which these are practically an enlargement. The most important of these will be a car shop 700 feet long and 100 wide, having a car transfer in front the same size as the building. Another shop similar to the car shop will be built, which will be 300 feet long and 100 feet wide. A machine shop 80 x 74 feet will connect two of the shops already built. The office of the superintendent of construction and repairs, with his staff of clerks, will be in a two-story brick building 20 x 50 feet. A planing mill 250 x 74 feet will also be built, with a boiler and engine house 60 x 40 feet. These buildings are but the first of those to be erected, and will nearly all be finished and ready for occupancy by July 1. Some of the old shops are already occupied by the sleeping car company's repair force, and the new buildings will be occupied as fast as finished."

Why the Middle of a Car is Preferable.

A very common theme of conversation among travelers is the question of whether or not a car rides easier in the middle than above the trucks. One of our railroad contemporaries some time ago published an article on the

subject, and took the ground that there could be no difference unless the sills and framing of a car yielded like the back-board of a wagon. There is certainly no yield to car sills and framing, yet every old traveler avoids the seats, and especially the sleeping berths, above the trucks, and old travelers generally know what they are doing. If the party who insisted that there could be no difference in the motion in different parts of the same car, had ever crossed the stormy ocean in a moderately long steamer, he might have received some enlightenment, especially if sea-sickness urged him to find the point of least motion. It is well known that there is less motion amidships than there is at the stem or stern, and less motion at the bottom of the vessel than there is on deck. A car acts in a similar way. Anything defective about the track jerks the wheels, which transmit the irregular motion to the truck, and that in turn gives it to the car. The point above the truck receives the concussion direct, and is forced upward, causing a jar on settling back. This jar is scarcely felt at the other end of the car, and has not more than half the intensity in the middle of the car. The consequence is, that the seats toward the middle of a car are on the neutral point where the jerks transmitted from the trucks are reduced to a comfortable limit. This is why riding in the middle of a car is, as a rule, not only safer than the ends, but more comfortable as well.

A saw without teeth that will cut a steel rail in two minutes is in operation at the "Central-Hudson" shops, in Greenbush, N. Y. The saw is run by a 90 horse-power engine, more power than is required to run all the other machinery in the shops, and is 38 inches in diameter, and three eighths of an inch thick at the edge. The disk is made of Bessemer steel, and runs at a very high rate of speed. While in operation a band of fire encircles the saw, and the many sparks flying from the revolving disk resemble a display of pyrotechnics. To keep the saw cool and prevent it from cracking, a tank of water is placed above the machine, from which a small stream runs down and drops on the saw while in motion. By this plan one saw will cut nearly 3,000 rails before it is worn out. A steel rail, after about six years' constant use, becomes battered at the ends, and by cutting them off the rails can be used in branch and switch tracks. The saw, while cutting, bears down hard on the rail, the end of which is left as smooth as the bottom of a flat-iron. One remarkable thing about the machine is that the chips cut from the rail fly back under the saw with such force as to form a solid piece of steel nearly as firm as the rail itself.

Master Car-Builders' Club.

The regular monthly meeting of the Club was held at 113 Liberty street, New York, on Thursday evening, April 15. The Secretary, Mr. G. A. Smith, took the chair, and announced the subject for discussion to be the

REPAIRING CARS BY CONTRACT.

Mr. Smith said that Mr. Bosdevex, who was to furnish some information on the subject, had sent word that he could not be present. Mr. Smith then said: From what I have seen of the repairs of cars that were made by contract, I have no doubt that all classes of cars can be repaired by contract with the workmen. When we look at what is going on at the west, I think it is time the contract business should be carried into effect. I do not see any other way to get over the labor question but by giving the men an interest in the work they do. As near as I can judge of the statements that were to be presented this evening concerning repairs that have been made for several years, it is perfectly feasible and simple. I have not thought so heretofore, nor until I saw the statements and became acquainted with the manner in which the accounts of the repairs were kept. I would like to hear from the gentleman who is present from the Lehigh Valley road. He has had something to do with the repair of cars by contract, and he might give us an account of how the work is done and the difficulties they have had to overcome.

Mr. Hunt (Lehigh Valley R. R.): I have not come here for the purpose of making any extended remarks on the subject, but I will tell how we do the work as far as we have gone with it. We have, for instance, two men working together on a car. They go to work and repair it. The inspector takes account of the number of pieces that are used in the job and then receives so much. The work is done in the shop and the car is repaired in a proper manner, and the work done as it should be. Each man gets half the amount paid for the work, whatever it comes to. We have not had very much experience as yet on this piece-work system, but that is the way we do it.

Mr. Smith: Suppose you put a side sill in a car, is your lumber framed before it goes out to the men, and the dimensions given—length, width and thickness?

Mr. Hunt: It is already framed, as far as we can frame it by machinery.

Mr. Smith: They will take a side sill out of anybody's car and replace it by one already framed?

Mr. Hunt: In our own cars we have different kinds of material loose and ready to fit the different cars.

Mr. Smith: All your blacksmith work is made up for them to put right on?

Mr. Hunt: Yes, sir. That is done by day's work.

Mr. Smith: Could not that be carried right into the blacksmith shop, and the contract given out to the men? Would not that be feasible, the making so many levers, for instance?

Mr. Hunt: Yes, I think that could all be done, but we have not got to that yet.

Mr. Smith: I understand it correctly, the people over at the Meadow Shops of the Pennsylvania R. R. can do repairs of any kind, down to the smallest amount, by contract.

Mr. Forney: I understood Mr. Bosdevex to that effect, I did not examine his statements very closely, but I gathered from what he said that he had systematized it down so that the smallest thing could be done. I would like to ask what the views of the gentlemen present are with regard to the way the trades-unions look upon this matter. I have had the impression that they were unfavorable to piece work. I do not say that is a reason why we should not adopt piece work, but it is one of the elements to be taken into consideration.

Mr. Smith: I understand those organizations correctly, all who have engaged in work of that kind are very decidedly in favor of it. The reason is that they can make more money. They weed out the poor workmen. If there are six men, for instance, on a piece of work and one is a shirk, the other five will have to do the work and receive no more individually than the one who does but little. They will naturally decline to continue in that way, and the consequence is that they will get rid of the shirk. When work is brisk they can get the good men they want, and when it slacks up so will be obliged to lay off, but when the rush comes they will all return to work. I cannot see but what it is the way to do, and the only way to start such a thing is to do just as has been done in other cases, begin on small things and gradually extend the system to larger and more important ones.

Mr. Hackett (Jersey Central): You might be placed where you would have to take the big ones first. We have been trying to see what the different jobs cost, keeping the cost as nearly as we could in case we should have to come to it, but we have not got very far. We have taken sets of coal boxes and such things, and the cost has been kept, as nearly as possible, to see what we could do.

Mr. Smith: I should think that at least a majority of all the parts of repair work could be done, a box car or a coal car, or whatever comes in. I think it could be repaired by contract very easily. If you get to doing the majority of the parts by contract, then feel your way along for the rest.

Mr. Hackett: We could take the coal car department very easily, because we do nothing else in that shop. But when we come to take all parts and go at it all at once, it looks to be a pretty big job to get the prices. A good many shops, when slack on repairs, set up freight cars. That could all be put in as new work under the contract system, which is better than repairs.

Mr. Smith: I would like to ask if most of the freight car work is not done by contract?

Mr. Hackett: We never built any freight cars by contract. We keep a good many men, and when work gets short in one department we set up freight cars. We have kept a number of men for engine repairs, and when work is slack in that department we turn them in on freight.

Mr. Smith: It looks to me as if work given out by contract is going to make better men; there are so many men that might do better than they do. Some don't seem to care as long as they get just as much money as some one else who does a quarter more work than they do, and the only way to make a thing go nowadays is to give the men an interest in their work.

Mr. Leighton: I suppose it will be pretty hard to fit a price to that class of men. My experience has been that the man who is the poorest workman and does the least work always wants the most pay. It is the "duffer" that generally causes the trouble. I do not think we could ever get a scale of prices that would suit every man in the shop, unless you have only one man, and this is hardly probable.

I think car repairing can be done by contract and have a scale of prices, but when it is done it will be very near the minimum.

Mr. Forney: The arrangement of this matter is one which calls for special qualifications. A man must have practice and experience, which can only be gathered in the shop and in the doing of the work. I agree with what has been said here to the advisability of adopting piece-work, as far as the effect upon the men is concerned. If a man has a motive for doing his work in a manner in which he will get the full benefit of all the work he performs, the effect upon the whole class would be to make them better men. In the matter of running locomotives, which has been up year after year before the Master Mechanics' Association, a system has been adopted by some roads of offering a premium to the man who makes the most favorable showing in burning the least coal, for example. Now the difficulty is this. One or two men, or a few men, manage by very superior intelligence and skill to get the premiums every month. The result is the others do not try. The Pennsylvania road has adopted a different system. They give the men the advantage of any saving in fuel they may make over a certain limit. I believe some men get premiums of from three to six cents a month, and some get a great deal more. The best man may not be the one who gets the most, but they have the benefit of what they do get. The natural effect would be that the men in the shops would also work very much in the same way. There is the

QUESTION OF TRADES-UNIONISM.

I do not know how we feel in regard to that, and in what I say I do not want to create the impression that I have any great objection to a trades-union. Probably if I was a workingman I should be a trades-union man, but one of the objects which I have tried to carry out has been, at least in some cases, that the poorest man should get as much as the best man. The piece-work system would be destructive of that whole thing. The underlying feature of that system is that a man gets paid for the work he does. If the trades-unions are all wedded to that idea of giving the poor man as much as the best man, I think they would oppose the piece-work system. My own conviction is that it is a mistaken policy upon the part of the trades-union people. Trades-unionism does not strike me as being either good or bad. It is good when they do wise things, and bad when they do unwise things. It is like many other things, I think its general effect has been favorable and will continue to be so. There are certain questions which have come up, and will come up from time to time, which are settled and decided. I can remember when a committee from a trades-union would not be received by many people. Now that has been materially changed. It is in my judgment a great piece of injustice on the part of the employer not to receive or hear a committee in a proper and respectful way who come with a proper grievance. There is another question that has come up and that is, the trades-unions propose to dictate to the Third Avenue Company as to the employment of certain men with whom the company have no fault to find. My own conviction is that that right will be resisted to the utmost in this country, and the trades-unions will ultimately be beaten on that. It is certainly a great injustice upon the part of any set of men to say who shall be employed and who shall not be employed. My own views of the matter are that there will be a great contest over it, and that finally the trades-unions will have to surrender that principle.

Mr. Wm. J. Richardson (Atlantic Ave. R. R., Brooklyn): Concerning this subject, I would say that I was much interested when I received a notice of this meeting, and saw that the subject for discussion was repairs of cars by contract. I would say we have been tied up in Brooklyn and know a little something about the matter of strikes, and I hoped that possibly there would be something said in regard to the repairs of cars by contract on steam railroads that might be transferred to our smaller street railway business. Mr. Forney touched upon the subject of strikes in connection with that of trades-unions. Having had some little experience in regard to them, I do not quite coincide with his views. Take our own road for instance. We are not in the least troubled by the same trade-unions in a way that to us is very humiliating. Now I hold that it is always a proper thing for an employer to consult with a committee of his own employees in regard to any grievance which the men may have relative to the way that they are being treated, and which they have anything to do. But as to the admission for a moment of the interference of an outside, irresponsible labor organization, such as the Knights of Labor, is simply to put yourselves in their power and to have your hands completely tied. Now what is the experience in Brooklyn? We, at the outset, were given to understand that while it was not an incorporated organization that was subject to the law directly, still it had a substantial, and to all intents and purposes, a very powerful bodily existence. Jay Gould has never been a pet of mine, but I must confess that he has risen very greatly in my estimation within the last month, and especially his general manager, Mr. Hoxie. He has dealt with the question in just the way it should be handled. Had we understood in Brooklyn that this organization was not what it pretended to be, but is what it is, namely, a combination, a great labor organization, with two or three men with brains at the head of it, and the rest with little or no judgment, all of them desiring something, not exactly knowing what, beyond the mere fact that they wanted an increase of wages and a decrease of hours, we should have had the courage and the wisdom at the outset to allow our road to be tied up. We submitted with as little grace as we could, not wishing to have a strike occur, thinking, as I have said, that they had much more power in their organization than we supposed. The result has been that they now demand, and have pretty well succeeded in their demand, that every employe that we discharge shall have his case, whatever it may be, brought before their committee, and the justice of it passed upon by the Executive Committee of the Knights of Labor. Certainly it is a most humiliating position in which to place a manager, and from personal experience I cannot see any lasting harmony or peace. Our troubles will crop out now and again. There can be no lasting peace between employer and employe when there is a lack of due and proper respect which an employe should give to an employer. There is now an utter absence of that. I am sorry to say, between the employes of the street railways and themselves, and between them and the employes of this thing will go on from bad to worse, until they make

demands upon us that no one who is not a Knight of Labor shall be employed by the companies. I speak feelingly, therefore, when I oppose Mr. Forney's view that we should treat with outsiders on behalf of our employes. I say never open that door. Always treat with a committee of your own employes; receive them courteously as gentlemen, consider their grievances, but never for a moment allow an outside organization to dictate or to interfere, or attempt to direct in any way your business management. If you do, just as surely your experience will be what ours has been, namely, an insufferable interference with your right of management by your employes.

Mr. Forney: I will try and put myself right. I did not mean to say an employer should receive a committee of outside men. I do not by any means say that, but I say that a committee of your own employes, if they have a grievance, should be received courteously and given a hearing. I do not go further than that, because I can very readily see the great evils which would come up under that. Neither do I say you should not receive a committee from the outside. It should depend upon circumstances. In regard to trades-unions generally, I would say that they are doing a good many unwise things, and I do not hesitate to say that they have done some good things. But the experience in England, where trade unionism is older than it is in this country, is that when the trades-unions become well off the strikes cease. My own view is that the matter is, that trades-unions will continue to improve. They will probably do a good many foolish and unwise things, but the training they get is a good one, and I think that good work will ultimately come out of it. It seems to me that it will depend very much upon the management, whether it is a good thing or an evil thing.

Mr. Smith: I should hardly think that the trades-unions of England could be compared with our own Western ones at least. In England the people are of one class. Our country is made up of many different classes, made up of the representatives of all nations, a different class of men entirely, that cannot be directed or controlled, but I should judge the men in England might be controlled. I think that there should be a great deal of consideration given to the working man. Many of these men in strikes do not know what they are doing. When we have such a class of men as I take it there is in St. Louis, there is only one thing that you can do with them. I won't say that that is, because they are not intelligent men. If we interest our laboring men as we have talked, give them an interest in all their work (repairing by contract), we stop these troubles.

Mr. Leighton: I suspect that this matter of piece work will not bring peace in the family. Saturday evening last I was at home, and was visited by a young man who was out on strike. He is a resident of New Haven, and a carriage maker by trade. In conversation with him I learned that he was or had been on piece work, but could not make nearly as good wages as formerly. He gave me the scale of prices, and he told me that it had been reduced from time to time until now it was very low. Perhaps a man is on the piece-work system, and his employer thinks that he is making too much money. I think it will operate that the employer will cut that man down a little. It is human nature. I am not opposed to the piece-work system. I am looking at this subject with all the intelligence I have got, but I declare I am surprised, and I think I shall get out before it is any thing like settled.

Mr. Smith: It looks to me as if these men in the strikes were standing in their own light. In almost every place where the union men run things to suit themselves contractors are afraid to take work. I know of a number of contracts that have been given up because the parties did not know what wages were going to be. I think the roads and others should look to men that have some intelligence. The majority of the strikers, and a very large majority, probably 19 out of ever 20, are led by some bad man. If it was not for this bad man the men would go to work, and the more work they have the more you have got to give. The more contracts that are given out the more there will be to give out, and the men will know just what they are going to do. A railroad company must be very careful in the present state of affairs to know how to act. I have probably in my time seen as much of strikes as most anybody, being connected with a road upon which they occurred almost monthly for twenty years. In my department, which employed as many as 1,200 men, I never had a strike. I found out there when I took charge, but I carried the department on by making myself familiar with the men. If a man is a bad man get rid of him. If he is a man that will make trouble get him out of the way, but treat the men just as well as they can be treated. You can get along better that way than in any other.

The Danger of Broken Stay-Bolts.

In the February number of the NATIONAL CAR AND LOCOMOTIVE BUILDER we described the method of drilling stay-bolts that had been adopted by the Chicago, Burlington & Quincy Railroad Company for detecting the presence of broken stay-bolts. We understand that the company's mechanical officers are every day receiving new evidence of the superiority of a drilled hole to hammer tests as a means of detecting broken stay-bolts. In the letter we received on the subject, we were told that when old engines pass through the shops they (the C., B. & Q. people) are more particular about drilling these bolts than in the construction of new engines. They found that notwithstanding all the sounding they boiler makers may have given the old bolts while the engine was being overhauled, the drilling almost invariably leads to the detection of broken ones after the engine has been fired up, which were overlooked by sounding.

Since we learned how successful the Chicago, Burlington & Quincy people had been with drilling compared with sounding, we have been making inquiries round where the sounding test is practiced, and have come to the conclusion that in very many cases the sounding test is a dangerous delusion. A good, careful boiler maker, zealous to do his work well, will detect the greater part of the broken stay-bolts he is searching for, but the ordinary workman who performs his duties in a perfunctory sort

of a way, will often overlook whole patches of broken stay-bolts. The railroad world has come to regard the system followed on the Pennsylvania Railroad for detecting defects in locomotive boilers as being highly efficient; yet we heard of a case lately where over twenty broken stay-bolts were found together when a locomotive was taken for repairs. Yet these stay-bolts, whose condition was a fearful menace to the safety of the boiler, were regularly sounded by what was regarded as an efficient inspector. We seldom go into a shop where extensive repairs on locomotive fire-boxes are being carried out without finding that many broken stay-bolts had escaped detection. In several cases where we examined the deterioration our wonder was that rupture of the fire-box sheet had not happened. It is quite common to find the sheets pressed out of their original shape. That the most serious kind of accident should happen occasionally to locomotive boilers is no matter of surprise, the astonishing part being that explosions are not more common than they are.

When a locomotive is at work there is no doubt a constant change in the relative length of the inside fire-box and the outside shell to which it is attached, due to change of temperature. This keeps the stay-bolts moving to accommodate the change of shape, and the strain appears to be concentrated on the portion of the bolt close to the outside shell, for there fracture nearly always takes place. Stay-bolts of good iron put in a workmanship manner, will no doubt have a longer life than those of inferior iron badly put in; but in the portion of a fire-box where expansion and contraction of the sheets are greatest, there is no remedy for the breaking of stay-bolts. They will last their natural life, which is by no means protracted, and no longer. The real remedy or precaution against the danger arising from broken stay-bolts is a certain method of prompt detection, and we know of nothing more simple, cheap, or efficient than that adopted by the Chicago, Burlington & Quincy people.

Inconvenient English Locomotives.

An engine driver running on the Manchester, Sheffield & Lincolnshire Railway makes the following complaints of the inconveniences of certain locomotives, through the columns of the *London Railway Review*. He certainly appears to have good reasons for complaining:

Can any reader give any information as to why the regulators of the new big goods engines built by Sacre at Gorton Works, numbers 428 and upwards (called Jumbos), are so hard to open, and why those of the engines built by Beyer and Peacock Company are so easy, as you have to get both hands, and all your bodily weight to get the Jumbos open, which is not very safe, especially whilst standing, as we are obliged to divert our attention from the shutters to regulators, and when we do get them open you go further than you are wanted to do sometimes, besides injuring your constitution with the jerking. Now, these hard regulators, combined with the plug sand valves that work with a rod through the footplate about ten inches, are a source of great danger, as it is impossible to see what you are doing whilst working them. At one time they will not run, and another sand comes out as thick as the pipe will allow, and if a pebble gets on one side of the plug, which very often is the case, it will run until the boxes are empty. Plugs are very good for water, but not for sand. I maintain, as an engine driver, that all sand rods should be in a position either in front or at side of driver or fireman, about half-way up the fire-box sides so that one may be able to handle the regulator and sand at the same time; and if Mr. Sacre had heard the impressions cast on them he would, no doubt, think it high time he resorted to the old but better valve, but let one hole be a little larger than the other, as you can make these last for a day's work, but the plug patent you can't make last above a trip, and then your mate has to be at the front wet boxes and the driver doing firing as well, as you can't regulate the plugs to do it, the battery you can at your will. Now, with all due respect to Mr. Sacre, building good and strong engines, which they have to be to work the loads over the banks we have to contend with direct instructions to those and let the tubes be a little larger, as the present ones require scraping down at least twice a day, and with doing this it soon knocks down the brick arch. With these few alterations I venture to say it would be far better for engines and safer for the servants generally. Hoping you will find space at your earliest convenience.

Trying to Serve Two Masters.

Workmen who become members of the Knights of Labor or of any other union for the advocacy and protection of their own interests are merely exercising an inalienable right which few people in America are disposed to question. But when a man has been selected to fill a position that gives him charge of workmen and which requires him to see that the men perform their duty to their employers, he has no longer any right to be prominently identified with a labor union. Nothing could have been more unseemly than the position occupied by Hall, the car-shop foreman whose discharge brought on the southwestern railroad troubles. The man was employed to see that a crowd of men, presumably Knights of Labor, performed a fair day's work, yet he was a violent agitator against his employers. It was impossible for a man so situated to do justice to his employers, and the wonder is that he was retained a day as foreman after continuing his action as a leading labor agitator. We recently heard of a case on a northern road where we think the master mechanic does injustice to the company by retaining the foreman of a blacksmith shop. This foreman, who is a leading light among the Knights of Labor, refuses to use labor saving devices, such as forgers, in his work, because their introduction would throw some men out of employment. When a foreman devotes his attention to forwarding the interests of his workmen in preference to those of his employer, it is time he was returned to the ranks where all his sympathies lie.



PUBLISHED MONTHLY

BY R. M. VAN ARSDALE,

MORSE BUILDING, ... NEW YORK
Chicago Office, 175 Dearborn St., Room 10.

JAMES GILLET, ... Editors.
JAMES STICKLER, ...

MAY, 1886.

Subscription.—\$1.00 a year for the United States and Canada;
\$1.50 a year for Foreign Countries embraced in Universal Postal
Union

EDITORIAL ANNOUNCEMENTS.

Advertisements.—Nothing will be inserted in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.

Contributions.—Articles relating to railway rolling stock, construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.

Special Notice.—As the CAR AND LOCOMOTIVE BUILDER is printed and ready for mailing on the last day of the month, advertisements, correspondence, etc., intended for insertion, must be received not later than the 25th day of each month.

THE CAR-BUILDERS' CONVENTION.

The list of subjects upon which committees are expected to report at the annual convention to be held next month Niagara Falls will be found on another page.

The most important of these subjects, and the one which seems likely to be in readiness for letter-ballot when the convention adjourns, is that of a Standard Truck for Freight Cars of 40,000 Pounds Capacity. The plans and drawings of such a truck were submitted by the committee last year, in accordance with instructions specifying certain leading points in its construction, but leaving some of the minor details yet to be worked out. The committee also recommended that some trucks should be built in conformity with the general plan and tested in regular service before the time for the annual meeting of the association this year. To what extent this recommendation has been complied with we are unable to say, but the committee will doubtless be prepared to submit such details as will meet the approval of the association, or which can be so modified that the truck as a whole can be submitted to a final decision as to its adoption. To defer the decision another year for the perfecting of subordinate details, after the general features have been set forth in the instructions given to the committee, and virtually adopted two years ago, would seem like unnecessary procrastination. There will be enough of that, in all probability, before the truck so recommended shall have become an accepted standard by all the roads. It is safe to say that ideal perfection will never be a characteristic of freight car trucks, nor will any standard the association may adopt be so complete and faultless as to suit everybody and forestall all improvements. It is a great point to get the problem narrowed down to the basis of a definite car load.

The committee on Automatic Freight Car Brakes, appointed two years ago, was continued at the last annual convention, and although the subject is one of paramount importance, no new information is likely to be presented this year as regards the comparative economy and effectiveness of the various freight brake systems now in use, the committee being now engaged in perfecting arrangements for a thorough testing of such of these appliances as may be submitted for trial in accordance with the prescribed conditions. The first tests will be made at Burlington, Ia., in July, next, after which the same devices will be subjected to an "endurance" test in regular service until April, 1887, when the preliminary tests will be repeated. No important action, therefore, as regards a selection is to be expected before the following June. In view of the fact that only a few years ago such a thing as an automatic freight train brake was considered next to impracticable, it is well to go slow. This suggestion may, perhaps, be superfluous, as the association has not hitherto shown anything like undue precipitation in matters of this kind.

A new committee was appointed last year upon Standard Appliances for the Safety of Trainmen, the previous committees on the subject having done about all that could be done in determining the proper position of brake-shafts, steps, ladders, the width of running-boards, etc., in order to afford the greatest protection to the men. Some six or seven years ago the subject was fully discussed by the association, and certain specific recommendations were adopted, the resulting benefit of which depended altogether on the extent to which they were carried into effect by the roads. But, unfortunately, little heed has been given to this action of the association, which was

then considered as final, and the protection of trainmen by means of better appliances continues to be discussed from time to time at railway club meetings and elsewhere, just as if the association could furnish the protection without the co-operation of the roads. In these circumstances, it is hardly to be expected that the new committee will recommend any additional safeguards. They will probably do nothing more than prepare a circular, in obedience to instructions, calling the attention of railroad managers to appliances of this class which have already been recommended as standards.

At the Saratoga meeting, two years ago, the New York Railroad Commissioners suggested to the association the idea of putting Trap Doors in the Roofs of Passenger Cars to facilitate exit in case of accident. A committee was appointed on the subject, and made a brief, but favorable report at the same meeting, but was continued with the request to furnish plans for such doors at the annual meeting last year (1885). No report was made, however, except a verbal one, in which the chairman said he didn't think the subject required any report; replies to 15 circulars had been received, and all but one were opposed to the plan, and he did not believe the car-builders of the country were in favor of it. The committee was again continued, and will probably make a report this year, but from the tenor of what was said in the discussion of the matter a year ago, not many trap doors are likely to be placed in the roofs or floors of passenger cars, unless a law shall be passed requiring it to be done.

The committee on Standard Dead-Blocks are instructed to prepare detailed drawings to be adopted as standards by the association. These drawings will doubtless be made to conform to the dimensions of double and single dead-blocks already approved by letter-ballot; the former being 8 in. square on the face and 6 in. thick, the distance between them 14 in., and from center to center 22 in.; and the latter 30 in. long, 7 in. thick and 8 in. deep.

The committee of last year on the Comparative Advantages of Constructing Freight Cars with or without Platform Timbers or Projecting End Sills, has been increased in size, and from the marked ability of the five members who now compose it, a report may be looked for as interesting as that made last year by Mr. Wall of the same committee, and which showed that of 183,000 cars owned by 23 roads, including two leading trunk lines, 56 per cent. of the number had platform, and that as to preference, 7 of these roads were in favor of platforms and 16 were opposed to them. On the car basis the platforms are a little ahead, but on the road basis they are considerably behind. The prospect for unanimity is not promising, and the result is likely to be an agreement to disagree.

The Maximum Outside Dimensions of Freight Cars, is a subject upon which a committee was appointed last year for the first time. If the committee should think it expedient they might safely recommend that the maximum dimensions of freight car bodies generally should be, say, 60 ft. long, 12 ft. wide and 15 ft. high, which would leave a sufficient margin for a variety of sizes less than the maximum. There being no settled limit of maximum capacity, unless 40,000 pounds for box, gondola and flat cars be so considered, we do not see the point in fixing maximum outside dimensions. The committee will no doubt put the thing in clear light, and it is needless to say that their report will be looked for with much interest.

British and Continental Practice in Matters of Interest to the Association, is another suggestive subject, which, if carefully investigated, will furnish material for a report of more than ordinary interest.

Reports will also be called for upon Standard Draw-Gear for Non-Automatic Couplers; Appliances to Prevent the Slipping of Wheels under Passenger and Freight Cars; and Reversing Height of Miller Draw-Bar.

The Executive Committee will also report upon the performance of the 12 couplers selected at Buffalo, and subsequently put in service on line cars under certain prescribed conditions calculated to insure a fair trial. The report of the committee will be looked for with intense interest, and may prove to be a conspicuous landmark in the history of the association.

HEAVIER FREIGHT CAR LOADS.

When figured out in all the details of construction, weight of cars, length of trains and cost of repairs, the economy of heavier car loads than the present prevailing standard of 40,000 pounds can not well be questioned. It seems reasonable, also, that with steel rails, better rail joints, improved permanent way and a gradual lessening of curves and grades, a better service should be got out of cars. A proposal to abandon 30-ton cars and go back to the old 10-ton standard would not be listened to for a moment. It is, therefore, not to be wondered at that railroad men of the progressive sort are becoming more and more in favor of 25 and 30-ton cars, many of which are now running, and many more are being built.

The expediency of fixing a maximum weight of load and dimensions of car body has often been discussed at car-builders' meetings, with no result except a tacit agreement to disagree and let the thing take its natural course. The usual arguments in behalf of larger cars and heavier loads are very plausible on their face, and may be epitomized as follows: If it takes 100 ten-ton cars, with 800 wheels, 400

axles, and a multitude of other appliances in the same numerical proportion, to carry 1,000 tons of freight, while the same quantity of freight can just as well be carried in 50 20-ton cars, with only 400 wheels, 200 axles, and a correspondingly less number of minor attachments, why not go a little further in the direction of economy and carry the same freight in 34 30-ton cars, with only 272 wheels, 136 axles, and other constructive details in the same diminishing scale? The list of collateral advantages, such as shorter trains, fewer draw-bars, etc., we need not recite, nor need we hint at the apparently still greater economy that would presumably result from the use of 40 and 50-ton cars. Indeed, why not assume at once that with permanent way and bridges sufficiently good and strong, and sundry questions of friction, speed and motive power disposed of, an ordinary train load of through freight might just as well be carried in one car and have done with it.

From this it is manifest that there is a limit to the economy of increased loads, and the car-builders are wise in not attempting to fix the limit when it is pretty sure in the long run to fix itself. The profitability of cars of large capacity, or of any capacity for that matter, depends upon the extent to which they can be run with full loads and the dead weight kept at a minimum. The conditions of traffic vary so much upon different roads, and at different times on the same roads, that no fixed standard of car capacity can be adapted to all the conditions. Any such standard must be adjusted to some average weight of load, irrespective of bulk, as a medium between extremes, and such average will also be a constantly varying quantity. If the bulk of a road's freight equipment consists of 20-ton cars, and the average car load both ways is 12 tons, a great deal of non-paying weight would be hauled, and which can only be lessened by using cars of less capacity and weight, or else by concentrating the tonnage in a smaller number of heavy cars. This, of course, has reference to miscellaneous traffic.

It is not difficult to determine the most desirable capacity for cars carrying full loads of certain classes of freight from terminus to terminus, and it is still less difficult as respects cars that are to carry but one product, such as coal, ore or live stock. In such case the load is uniform, and the cars can be kept together and run by themselves. As the great mass of miscellaneous traffic on all the roads can not well be adapted to fixed dimensions or capacity of cars to be adhered to by all, it follows that the cars must be adapted to the traffic as far as may be. And this is just what is being done. No road is going to build 30 or 40-ton cars to any greater extent than they can be used to advantage on the line or its immediate connections. It is strictly, as it seems to us, a matter of the survival of the fittest.

THE DIVERSITY IN STANDARD JOURNAL BEARINGS.

The railroad world has always regarded the work which the Master Car-Builders' Association have done towards bringing about uniformity in rolling stock parts, as highly valuable and productive of material saving to railroad companies. The most important standards that the association have settled upon, are the car axle and the journal bearing. If a standard piece of machinery is to have any value to a railroad company, it must be made accurately enough to be interchangeable; yet investigations and observations made for several months back have led us to the conclusion that the M. C. B. journal bearing found in service is nearly as diverse in its dimensions as there are roads using it. By no means the least economical advantage accruing from the use of interchangeable standard parts is, that they can be manufactured in large quantities and sold as a staple article of trade, but we assert without fear of contradiction that no manufacturer of brass goods would venture to supply a railroad company with Master Car-Builders' standard journal bearings without first finding out the dimensions of the brass used by the road.

As an example to illustrate the character of standard bearing in use, we will give a few measurements taken from a journal bearing belonging to the Michigan Central Railroad. The measurement across the bottom of the bearing was $4\frac{1}{8}$ instead of $4\frac{1}{2}$ inches as the standard calls for. Across the top of the bearing the distance was $1\frac{1}{8}$ instead of 2 inches. All other dimensions were $\frac{1}{8}$ out, except the lugs on the sides of the brass, which were $\frac{1}{4}$ inch narrower than the standard size.

A journal bearing belonging to the United States Rolling Stock Company, and extensively run under their cars, was found to be only $4\frac{1}{2}$ inches across the bottom, where it ought to be $4\frac{1}{8}$ inches, and several other dimensions were out $\frac{1}{8}$ inch. A great many roads make the side lugs $\frac{1}{2}$ inch wide instead of $\frac{1}{4}$ inch. This, in fact, seems to be the prevailing practice, and master mechanics and car builders, when questioned about the matter, insist that lugs $\frac{1}{2}$ inch wide are more liable to break than the narrower lug. The dimensions of the standard key are just as diverse as those of the journal bearing. The practical effect of this diversity of sizes is, that in many instances bearings do not fit the keys they are placed under and heating results. Were the truth known, it would be found that many annoying delays with hot boxes result from this cause. A leading superintendent of motive power, talking on this subject, said he had great annoyance at one time from tender bear-

ings heating, and he was using what he supposed to be the Master Car-Builders' Standard bearing. On investigating the trouble, he discovered that through a mistake of the pattern makers, the journal bearing and key deviated in several dimensions from the standard, and that the trouble arose from those two parts not fitting together.

During the last few years, railroad mechanical men have grown wonderfully in the grace of accuracy that requires an inch to measure thirty-two thirty-seconds instead of thirty-one or thirty-three thirty seconds; but there still lingers round too much of the sentiment that leads to the ordering of U. S. standard inch taps one thirty-second large. This loose unmechanical sentiment is responsible for the inaccurate methods of doing work that have wasted the labor expended by the association in establishing a standard journal bearing; for it is undeniable that many of the most important advantages that should accrue from the use of standards are lost in this case. If the ordinary pattern maker is to be depended upon to measure his dimensions from a drawing, so that the required sizes will be produced, we fear the standards will always vary so much on different roads, that the system will fall into disrepute and the word "standard" become a subject of derision. The Master Car-Builders' Association must assume a new duty if they wish standards to maintain any value. The proper and effectual remedy for the inaccurate practices that threaten to undo the work of the association is for the Executive Committee to have patterns made under a competent inspector and supplied to the railroad companies using standard castings. When the Westinghouse brake first came out, some master car-builders wished to make their own couplings, and considerable dissatisfaction was caused by the brake company insisting on furnishing them. Mr. Westinghouse showed that he understood the idiosyncrasies of pattern makers, and it is high time that the association understood them in the same spirit. The time of the next convention could not be better occupied than in devising the necessary arrangements that would result in making standards standard.

RAILWAY PROGRESS IN ENGLAND.

The class-car system which has been so long adhered to upon English railways appears to be undergoing a modification, and although the change is a gradual one, it points to the ultimate merging of second and third class passengers into one class on all the lines in the kingdom. Practically, this has already been done on two leading lines operating more than 2,000 miles of track, not as a mere experiment, but as promising beyond all question the interests of the lines and the convenience of the traveling public. Twenty years ago, a very marked distinction existed between second and third class passengers, the former belonging to the mass of middle class respectability, and the latter to the great underlying strata extending down to the dregs. Since then there has been a gradual leveling up of third class accommodations, from the condition of traveling barracks with hard board seats, dirty floors and unwashed windows, to something like comfort and cleanliness. This, and the low third-class fares, have had the effect of thinning out the occupants of second-class cars and compartments, until the official returns of traffic show an immense disparity in favor of the third class in the matter of revenue and number of passengers carried, as compared with the first and second class combined.

Other changes are also impending. No road in England makes any money from its first-class travel, and it seems to be a question of time only when this branch of passenger service will be made remunerative instead of being an incubance. First-class carriages are now run with an excess of empty seats to accommodate transients, although they would not yield a profit if the seats were not empty. The first cost of these carriages is some twenty per cent. more than that of the others, the dead weight is considerably more, the receipts per square foot of floor space per passenger are less, the number of passengers carried is only about five per cent. of the total number, and the receipts only about fourteen per cent. of the whole, although the fares are twice as much as for third class.

In respect to a change in the style of cars, there are some formidable obstacles to be overcome, aside from inveterate conservatism and a chronic dislike of any form of vehicle that is not suggestive in some way of the old hackney-coach, with its four wheels, side doors and isolation. This model having been adopted for passenger cars in the days of Stephenson, most of the roads have been built to accommodate the low and narrow vehicles that now look so diminutive in English trains. The width and height of the cars can not be increased without making a corresponding change in bridges and tunnels and cutting away walls and platforms, which would be a virtual reconstruction of the roads. These obstacles, however, ought not to stand in the way of a means of communication at all times from one part of the train to another by a bell-cord inside the cars instead of outside. The short, low-roofed narrow cars are not favorable for adequate heating appliances, and in the winter season they are almost invariably comfortless and cold. On a few roads an attempt has been made to introduce lavatories, and those other indispensable conveniences for health and comfort, the absence of which has hitherto

made a journey on an English railway a thing to be dreaded. The American baggage check system that has for years worked so effectively upon our roads, would seem to be an improvement upon the old no-check system that is so pertinaciously adhered to in England, but its merits are not yet recognized, probably because its adoption would be an inroad upon the settled order of things as radical and dangerous as the cutting of a bell-cord hole through the compartment partitions. But, as we have said, there are mechanical reasons in England for adhering to the stage-coach pattern of rolling stock, but in Australia, where the construction of railways began more recently, these reasons do not exist to the same extent, if at all. The miserable little composite cars used there many years ago were similar in their construction to the English orthodox pattern. The first American cars introduced in the colonies were a great improvement, and their superiority was at once recognized. They seated 56 passengers each, there were no prison-like compartments, they were higher and more spacious and contained the necessary toilet conveniences. Since then, there has been a steady improvement in the style of both cars and engines on the Australian roads, and it has been mainly in the direction of American, and away from the characteristic conservatism of English practice.

WHEEL TREADS AND FLANGES.

Of the many diversities in railroad practice in this country originating in the independent action of individual roads, the most difficult to deal with in attempting to bring about uniformity are the forms of wheel treads and flanges. The problem, as it now stands, is beset with so much complication that it is doubtful whether any near approach to unanimity has already been reached by the Car-Builders' Association is possible, at least for the present. The trouble and inconvenience resulting from this diversity, not only in wheels, but in rail sections and track gauges, will continue to increase with the growth of traffic and render the adoption of some practicable means for overcoming, or at least lessening the difficulty, more imperative every year.

The form and section of treads and flanges recommended by the committee a year ago for adoption by the association, having failed to receive a two-thirds vote by letter-ballot, the whole subject is thereby opened up for reconsideration, and must be grappled with again.

It can not be allowed to rest, however distant may be the prospect of bringing order out of the present chaos. The forms and dimensions proposed by the committee, although not technically adopted, received a majority of 87 of the 379 votes cast, and only 20 less than the requisite two-thirds. The question now is, whether the rejected forms can not be modified so as to secure their adoption by the association this year or next, as being the best disposition that can be made of the subject by the association. It will then rest with the roads to make their practice conform as far as may be to the standards recommended. And this, in the face of all existing complications, will be no easy matter. The wheel tread must either be coned or straight, or part straight and part beveled. Opinions upon the alternatives of coned or cylindrical treads are so divided and so tenaciously adhered to that unanimity seems out of the question. The existing track gauges range from 4-34 to 4-9, wheel gauges between flanges vary from 4-41 to 4-34, and the spaces between guard rails and main rails range from 14 to 24 inches in width, and to add to the confusion, a standard of diversity has been adopted by the association, requiring the distance between the backs of flanges to be not more than 4-54 nor less than 4-54. Years ago, the old six-foot track gauges of the Erie; Delaware Lackawanna & Western; and other lines, were changed to the prevailing standard to facilitate interchange of traffic and avoid isolation, and it is a common thing to speak of the standard gauge of all Northern roads as 4-84. This, however, is not the case, and all this wheel gauge and interchange trouble arises from the fact that the track gauge of the Pennsylvania Railroad and its western connections, including the Philadelphia & Erie, is not standard. In this respect, it may be said of these roads that they are in the Northern system but not of it within half an inch, and this half inch is no insignificant matter.

A standard form of treads and flanges once established and adhered to, the way would be clear for a standard rail section to conform to the treads and flanges. At present there is an endless diversity, and consequently a great deal of extra wear and tear, caused by the mechanical antagonism between wheels and rails.

LIGHT-WEIGHT PASSENGER CARS.

There are many car-builders who say that the general run of passenger cars are too heavy and tax the motive power with an unnecessary quantity of dead weight. That this is so is quite evident when the weight and seating capacity of cars upon different roads, and even on the same roads, are compared, showing an amount of dead weight per passenger varying from 350 to 800 pounds, and in exceptional cases even more than this. Assuming that the conditions of service of such cars are approximately

the same, the maximum difference of 250 pounds is quite an important matter. To determine just how much superfluous weight there is in each car, and how it can be got rid of in the construction without reducing the standard of strength, is a problem of some difficulty. In fact, it may be said that the proper proportion of dead and paying weight in a passenger car is an unknown quantity that can never be reduced to the point of mathematical exactness. It can be determined, no doubt, with some approach to exactness, how heavy a car should be to carry a passenger in every seat, the car to be built according to specifications in which the quality of materials as to maximum of strength and minimum of weight, is made the paramount object, leaving out all contingencies of accident in which extra weight and strength are essential elements of safety. But should this, it may be asked, be made the measure and criterion of lightness? Is no margin of weight and strength to be allowed for collisions and derailments, over and above what is just sufficient for a car that is fated never to collide or get off the track? Light weight cars are certainly more easily wrecked than heavy ones; but, say the light weight advocates, no cars whether light or heavy are built primarily to be wrecked, any more than houses are built to be struck by lightning. So long as their regular movements on the track are not interfered with, light cars are good, and economical and comfortable, so let us build such cars and take the chances.

This is the way some car builders look at it. Others are equally in favor of light cars—in the abstract—but with a proviso that they should be heavy enough and strong enough to hold together when running over cross-ties or rolling down steep and rocky declivities. The under and upper framing, trussing, etc., must be strong enough to withstand any collision or shock of the average kind, dead weight or no dead weight. Admitting this, it may be asked, if a car so constructed runs all its life-time without serious accident, as a great many cars do, is the excess of weight put into it to meet contingencies of accident, so much superfluity and a needless tax upon the motive power that might just as well have been avoided?

As to what is the happy medium of weight for a passenger car of any given seating capacity, nobody knows. It is a matter of opinion, or of conjecture rather, and is likely to remain so for a good while yet, because there is no recognized standard by which to determine how heavy a car should be to carry a given number of passengers under all the conditions and contingencies of service.

With freight cars, especially those in through traffic, the case is different. No matter how much timber and iron goes into their construction, the stenciling and overloading are pretty sure to keep the dead weight at zero.

LABOR STRIKES.

The labor strike carnival which has for weeks past prevailed throughout the land, is assuming a phase which can hardly fail to bring about a collapse of the agencies by which it is directed. Workmen's associations are a benefit to labor only so far as they are kept within their sphere and the limits of law. Excesses must be restrained and the rights of individuals and of property respected. Dictatorial and arbitrary action on the part of leaders who arrogate to themselves powers above the law and imperil the business of great communities, naturally inspire the rank and file of these associations with the wild phantasy that the normal relations of capital and labor, of employers and employed, are to be reversed. Every thinking man knows that such a thing is impossible. No statute law can change their relations, much less can they be changed by the edicts of self-constituted agencies unknown to the law. As well might we talk of reversing the relations of hills and valleys or of creditor and debtor. Demands which practically require employer and employed to change places can not be enforced, and all attempts to enforce them can have no other effect than to derange and paralyze business, drive capital into retirement, and lessen the demand for labor in the face of an excessive supply.

When labor organizations are so managed as to raise the preposterous issue that employers must not employ labor outside the membership of certain societies and associations, the issue must be squarely met. If this claim is admitted, it is mockery to talk of a free country and equal rights. The assertion of such a principle is a denial of the freedom of every person to make contracts or to be parties to business transactions. The boycott is the natural outcome of this insanity. It is a procedure which arrays labor against labor, and is effective only against the weak. The strong can resist and defeat it. It is in the nature of a conspiracy—base, mean, tyrannical and cowardly—and labor organizations will do well to put it under ban unless they wish to encourage practices worthy only of the dark ages.

If the actual cost of the strikes which have occurred could be ascertained the sum total would surpass belief. Thousands of workmen thrown out of employment, local industries crippled, supplies for subsistence cut off by the interruption of transportation, sales of seasonable goods lost, contracts for railroad and other supplies canceled, capital withheld from investment, vast sums raised for maintaining labor organizations by levies upon their mem-

bers and by contributions from sympathizers, and a widespread distrust and uncertainty engendered as to the future. All this, when put in the scales against the actual gain, would show a frightful balance on the wrong side—a balance that can never be wiped out.

The Knights of Labor, so long as the discipline of its membership can be maintained, wield a great power, and a dangerous power if it is used without discretion as to its limitations. It behooves its managers to remember that public sentiment is the umpire and final arbiter of the issues raised, and that in this country public opinion will tolerate no proceeding which threatens the supremacy of the principle upon which the government is founded—the absolute equality before the law of every person within its jurisdiction. No man in this country has any exclusive privilege in this respect. In the multitude of transactions in a great business community, the relations between buyer and seller, employers and employed, will at times become unnaturally strained, but the right to go into the market, whether of labor or commodities or anything else, with perfect freedom to give or take, is the only way to relieve the strain and restore the equilibrium. There will always be more or less extortion, exaction and overreaching. But any combination to forcibly prevent a man from doing as he pleases within the limits of the law, and especially in the matter of hire and wages, is the beginning of anarchy. And as anarchy is not a permanent condition of human society, the freedom of every man to work or not work, buy or not buy, sell or not sell, although it may be temporarily infringed upon, is sure in the end to be vindicated and maintained.

UNDERESTIMATING THE EFFICIENCY OF LOCOMOTIVES.

Many mechanical engineers of spotless reputation and known to possess considerable professional ability display lamentable ignorance of the work done by locomotive engines, and at what expenditure of steam the work is performed. The tendency of late years has run so strongly towards sub-dividing engineering into specialties, that being ignorant of any branch of the profession entails no discredit; but when an engineer uses his professional standing as an assurance and guarantee that he is a reliable authority, and under that pretense gives opinions on matters he knows nothing about, he is guilty of a most reprehensible and dishonorable act. During the last few years mechanical engineers have made public statements about the performance of locomotives that displayed a ridiculous combination of ignorance and prejudice; yet the calculations of these statements, conceived in error and brought forth in iniquity, have been used as the basis for effecting prospective improvements that involved the expenditure of vast sums of money.

The engineering world interested in giving opinions about the locomotive, and the financial world liable to invest in schemes for the improvement of the engine, ought to know that a well-built, properly managed locomotive is a more economical steam user than the ordinary stationary engine, and that high-class automatic or condensing engines display a very small margin of economy over a good locomotive. An engine of this kind running a passenger train that can be handled easily, does the work on an expenditure of about twenty pounds of steam per horse power per hour. The ordinary freight engine will use double or treble that amount of steam, for the simple reason that freight locomotives are habitually over-loaded, and must let the steam follow the piston so far at full-pressure that the terminal pressure is necessarily very high. Passenger locomotives that are worked hard to make running time, and have to be forced rapidly into speed after frequent stoppages, will use nearly as much steam per horse-power as the freight engines. The fact that a locomotive is using twice the steam which ought to be required to do the work, is really no reflection upon the engine, but generally is the fault of overloading, a condition that will deprive any class of steam engines of an economical record. The engineers and inventors who attempt to transmit the power indirectly that has been applied directly by locomotives, and depend on stationary engines giving a margin of economy, are every day finding that the margin is on the wrong side.

It is curious to note the objections raised by the parties interested to an innovation about to be introduced on an English railway of paying trainmen by the trip instead of by the day. They allege that the change will be a retrograde movement, since it introduces an iniquitous system of piece-work into railway operating. So decided is the objection of English workmen to piece-work, that the organ of the British railway servants recommends the men affected to strike rather than accept the slavish conditions they seem to think piece-work must entail. Pay for work done is almost the universal rule among American railroad trainmen, and they would nearly all consider a return to day pay a thoroughly retrograde movement to be resented strongly. Conservative-like, the Englishmen object to a change lest it may bring them evils which they note not of, while those who have passed through the change admit that it brings almost unmitigated benefit.

A DISCUSSION which has been going on for nearly six months in the columns of *Engineering* regarding compound locomotives has just closed. The discussion has been very interesting and edifying, but we do not think it has tended to increase the popularity of compound locomotives. To outsiders it appears that the various writers proved that compound locomotives burned quite as much coal as simple engines in pulling the same trains, and that the former were considerably more costly for repairs and lubricants. Nothing that has come out in the controversy is calculated to induce American master mechanics to try compound locomotives as a means of reducing operating expenses.

In the course of recent journeys we have heard of several very expensive wrecks to freight trains through the breakage of axles. When the roadbed is rigid with the frost of winter the running gear of cars is subjected to the most searching tests. The heavy car loads that are becoming universal transmit tremendous blows to the running gear, especially on rough track, and the old worn axles are in many cases too weak to resist the shocks. It is a very hard matter getting shippers to discriminate about what cars are capable of carrying 20 tons and those that are too light for that load. Unless the agents of the railroad company watch shippers very closely, 20 tons are loaded into all cars without discrimination as to the safe limit. This has always been the way. The outside load limit of the strongest cars is taken as a safe load for all cars. Shippers displaying a tendency of this kind is sufficient reason why master car-builders should have axles rejected that are too weak to carry the heaviest loads habitually put upon them. A grave mistake was made at last convention in reducing the size of axle that might be passed in the interchange of cars. We are afraid that the change may prove rather expensive to some railroad companies.

In the numerous discussions that have lately been carried on respecting the relative merits of American and English locomotives, the English writers always hold out as a sort of trump card the allegation that the English locomotive is much more economical with fuel than these built in this country. We do not believe that any reliable data has been collected as to the relative fuel economy of the two types of engines. Seven years ago, Mr. John E. Martin, Locomotive Superintendent of the Talca Talcahuano and Angol Railroad in Peru, made a most exhaustive and carefully conducted series of experiments with locomotives on his road, with the view of getting the greatest possible amount of work in return for the fuel consumed. There were both American and English locomotives on the road. In his report of the experiments, he said that a Rogers locomotive belonging to the company was the most economical engine he had ever seen.

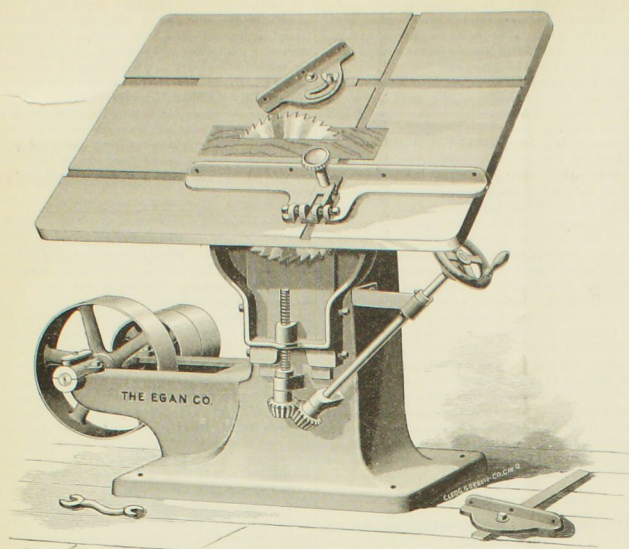
At the April meeting of the Master Car-Builders' Club, the subject of repairing cars by contract was discussed, a report of which we give elsewhere. The painting and varnishing of cars were also included in the programme as previously announced. No attention, however, was paid to these topics, and the time that should have been given to them was devoted to an exchange of views about trade unions and street car strikes in Brooklyn. There was an excellent opportunity for raising a point of order as to the limits of the discussion, but no one seemed to see the point.

The remarks which appeared in the "Shop Notes" of the February CAR AND LOCOMOTIVE BUILDER about Mr. Allen Cooke's method of turning driving wheel tires, has attracted considerable attention among master mechanics. Mr. Cooke turns the tread without any cone, but leaves a small fillet at the neck of the flange. This arrangement appears to be very effective in preventing flange cutting. The fillet wedges the wheel away from hugging the rail, and the wear keeps uniform about the middle of the tire.

OUR cousins on the other side of the Atlantic have devoted a great deal of ingenuity to the perfecting of buffer-stops for railways. A buffer-stop is an obstruction placed at the end of the track at terminal stations to receive the shock of the locomotive and bring the train gradually to a stop when the brakes fail to hold. We have a good many more trains running here than they have in Britain, yet there has arisen no need for buffer-stops. We take the more practical course of using a brake that will not fail when it is wanted.

We are authorized to contradict a rumor being circulated in the West to the effect that the Pittsburgh, Ft. Wayne & Chicago Railway Company are putting up the Boon locomotives. Instead of being cut up, these engines are regarded as of high value and thoroughly efficient.

THE OFFICIAL RAILWAY LIST, for the current year, has just been published by the Railway Purchasing Agent Co., Chicago. It contains a list of officers of the railways in North America, corrected to April 1; also an index of names of railway officials contained in the book; illustrations of standards adopted by the Master Car-Builders' Association and other useful information.



Improved Variety Saw.

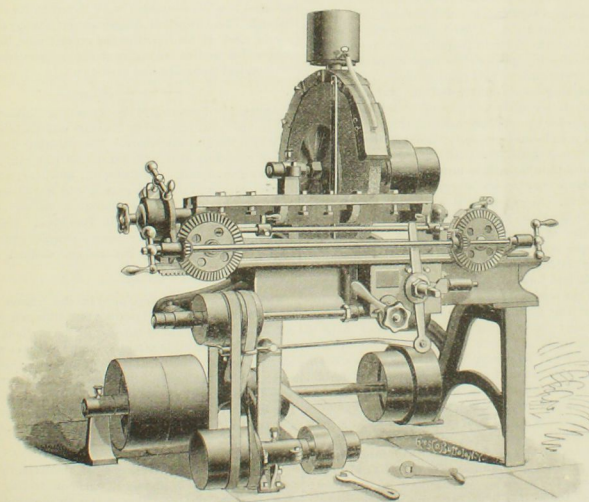
The engraving represents an improved machine for doing all kinds of plain and bevel sawing. It is adapted to a wide range of work. The precision and accuracy with which it can be handled, its easy adjustment and the strength and durability of the parts, make it a useful machine in car shops for preparing material for inside finish, as it can be used for ripping, cross-cutting, leveling, grooving, mitering, etc.

The machine is self-contained, the frame being a cored pedestal, supporting the table and carrying the counter-shaft. The table is of cast iron, well ribbed and braced, and can be set plumb at right angles with the saw, or adjusted to any level up to 45 degrees.

The table is raised and lowered in planed, gibbed ways, with adjustment for wear. The mandrel is of best cast steel and runs in self-oiling boxes. The fences can be used on either side of saw, giving the operator every advantage and convenience, especially when using the table on a level. This point will be appreciated by the practical sawyer.

A 14-inch saw is usually furnished with the machine, and should run 3,000 per minute. The counter-shaft is on the main frame, and the L and T pulleys are 10 in. diam. by 4½ in. face and should run 750 revolutions per minute.

Manufactured by The Egan Company, Cincinnati, Ohio.



Improved Automatic Knife-Grinder.

This machine is used for grinding the knives used on planing machines, trimming presses, paper machines, leather-splitting machines, tobacco cutters, shears, etc., etc.

It is strong, well proportioned and thoroughly made. The working parts are well protected from emery and dust. The automatic cross-feed can be adjusted so precisely that it will grind one six-thousandth part of an inch at each traverse of the carriage, and as much more as desired, and it will stop feeding and grinding at any point; hence when properly adjusted and set in motion, no attendant is required, a saving in itself that will soon pay for the machine. Both ends of the knife are advanced or fed forward equally at the same time, an advantage that can only be attained by an automatic cross-feed. There is a graduated dial at the end of the knife-bar, so that the bar can be quickly set and the knife ground to the same degree or level as when previously ground. The knife can be set with edge up or down, to grind to or from the edge. Cone pulleys on feed shaft regulate the carriage to any desired speed. The emery wheel is 26 x 1½ inches, with 13-inch hole, and future wheels will cost one-fourth less than ordinary

wheels, as the hood represents that portion of the wheel; it is hung in a swinging frame easily adjusted by a forward movement to the wearing away of the wheel, and cone pulleys increase the speed correspondingly. A folding hood nearly surrounds the wheel, which prevents the water flying, and is adjustable to the wearing away of the wheel. The hood has a reservoir on the top from which a small amount of water runs on the wheel and prevents heating and drawing the temper. It is impossible to grind straight with a dry wheel, as, in grinding, the knife heats, expands, and grinds more in the center than at the ends, leaving it hollowing when ground, all of which is avoided in this machine by using a plentiful supply of water. A galvanized iron pan on the carriage catches the water and carries it away. A centrifugal pump can be attached, to furnish a supply of water for the wheel, from a tank located under the machine, using the water over and over; this is recommended whenever running water is not easily furnished. When the pump or running water is used, the wheel can safely be run one-third faster and do that much more work—a fact worthy of notice. The tight and loose

pulley on the countershaft is 12 inches diameter by 5 inches face, and should run from 815 to 400 revolutions per minute, according to the amount of water used. The carriage can be instantly stopped by dropping the worm out of gear, without slipping any belts or stopping the wheel—a convenience in putting on and taking off knives. The worm and worm gear are run in an oil dish to prevent wear. The machine can be made to run with cup-shaped or tub-wheel, for grinding flat surfaces not too wide, and for grinding knives on a bevel not concave. Special attachments can be made to do a large variety of grinding, such as surfacing off hard dies, grinding chilled and steels rolls of small size, rotary shears, etc., etc.

Manufactured by the Springfield Glue & Emery Wheel Co., Springfield, Mass.

THE CUMMER ENGINE CO., of Cleveland, O., have orders for a 287 h. p. Cumber automatic engine for Wahl Bros., of Chicago, and a repeated order for a 215 h. p. engine from the Marshall Roller Mills, Marshall, Mich.; also orders for 9 "Simplex" automatic engines of 50 h. p. and under, and 2 complete Hoisting Plants for H. M. Benjamin & Co., of Milwaukee. They have shipped a 50-ton Refrigerator Plant to the J. Walker Brewing Co., of Cincinnati. Sales of Jonathan Mills Universal Flour Dress or are on the increase.

THE NATIONAL PAINT WORKS, at Williamsport, Pa., have recently been enlarged so as to double their capacity. The Edison incandescent electric light has been introduced so that the works can be run night and day to keep up with orders. Large quantities of their paints have recently been shipped to the Keystone, Phoenix and Union Bridge Companies, and also to a large number of railroad companies and car-builders. A branch office, under the management of Mr. John F. Wilcox, has been opened in Chicago to meet the increasing demand for these paints.

MR. W. BAILEY LANG, 50 Beekman street, New York, has retired from business and from the agency of the Low Moor Iron Co., of England, and is succeeded by Mr. E. Y. Jacobs, who will have the entire control of the agency, with offices at Peter Building, New York. The Low Moor business in Boston and the Eastern States will continue under the management of Mr. W. D. Richards, 39 Fort Hill Square, Boston, as heretofore.

THE AJAX METAL CO., of Philadelphia, recently received an order for fifty tons of their metal from the North Eastern Railway Company, of England. That company have been experimenting for some time with Ajax metal journal bearings, and the results were so satisfactory that this large order was given.

BYRAM & CO., of Detroit, have recently shipped one of their Colliar cupolas to the Betts Machine Co., Wilmington, Del., and are making the second cupola for the Philadelphia Bridge Works, Pottstown, Pa.

MR. F. W. COOLBAUGH has been appointed Agent of the Dickson Manufacturing Co., of Scranton, Pa. His office is at 112 Liberty street, New York.

BYRAM & CO., of Detroit, are making a Colliar Cupola Furnace for J. B. & J. M. Cornell, and C. H. De Lamater & Co., both of New York City.

Our Directory.

We note the following changes since our last issue. Our readers will do us a great favor by giving us prompt notice of any changes that may come to their knowledge or of any errors that may be noticed in our list:

Boston, Hoosac Tunnel & Western.—C. A. Coombs, late of the Knox & Lincoln, has been appointed General Manager in place of H. L. Morrill, resigned.

Boston & Lowell.—W. F. Simonds has been appointed Superintendent of the Southern Division in place of J. F. Crockett, resigned.

Indiana.—This road is the successor of the Chicago & Great Southern.

Knox & Lincoln.—Wm. L. White has been appointed Superintendent in place of C. A. Coombs, resigned.

Missouri Pacific.—F. B. Drake has been appointed Superintendent of the Missouri Pacific, and J. J. Frey, Superintendent of the Missouri, Kansas & Texas road north of Denison, in place of E. K. Sibley, resigned, and who was Superintendent of both roads.

Pavia, Decatur & Evansville.—George L. Bradbury has resigned the position of General Manager.

Southern Pacific.—G. W. Coddington is Superintendent of Visalia Division in place of W. W. Frugh, resigned; J. H. Whitte is Superintendent of Truckee Division, vice G. W. Coddington, transferred; J. A. Muir is Assistant Superintendent of Los Angeles, Yuma, Wilmington, San Diego and Los Angeles & Independence Divisions, in place of I. H. Polk, resigned, and J. S. Noble Superintendent of Gila and Tucson Divisions, in place of J. A. Muir, transferred.

Texas & Pacific.—L. S. Thorn is Superintendent of the New Orleans Division, vice Geo. Dimmick, resigned.

Texas & St. Louis.—W. R. Compton has been appointed General Superintendent.

Utica & Black River.—This road has been leased by the Rome, Watertown & Ogdensburg. H. M. Britton, General Manager of the Rome, Watertown & Ogdensburg, is also General Manager of the Utica & Black River.

Washington & Potomac.—This road is the successor of the Southern Maryland.

Employment.

WANTED.—By a young married man, a situation as Foreman Car-BUILDER; has had eleven years' experience in building and repairing passenger coaches and freight cars, and has served for some years as Master Car-BUILDER for a leading railroad. Can furnish good references. Address "W. N. C.," office of NATIONAL CAR AND LOCOMOTIVE BUILDER.

Gentlemen:

How natural it is to try to get *something* for *nothing*, and expect satisfaction in the use of materials that look well, but have no real merit. This is exemplified in painting cars as much as anywhere. The Perfect Method Paints manufactured by us insure durability and saving of time otherwise lost in repainting, or lost by decay of the wood and rust of the iron when the paint has perished, as most of the ordinary paint soon does.

Manufacturers High Grade Paints and Colors for Railway Use.

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Established 1856.
Shipman & Bolen, Mfrs. of fine
Railway Varnishes.
Our Varnishes excel in durability.
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FINEST QUALITY
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The WESTINGHOUSE AUTOMATIC BRAKE is now in use on 15,000 engines and 125,000 cars in all parts of the world. This includes 45,000 freight cars.

The WESTINGHOUSE AUTOMATIC BRAKE is the only continuous brake that has been successfully used on freight trains.

THE AUTOMATIC BRAKE will, in consequence of its quick application, stop a train in the least possible distance.

THE AUTOMATIC BRAKE on freight trains, as in passenger service, applies itself instantly to all parts of the train in the event of the train breaking into two or more parts, a feature of great importance in view of the statistics published in the *Railroad Gazette*, which show conclusively that a majority of the collisions are caused by the breaking in two of trains. (See *Railroad Gazette*, Feb. 12, 1886, page 113.)

THE AUTOMATIC BRAKE also applies itself to every car in the train, in the event of any accident to the brake apparatus of such a nature that it would render any non-automatic continuous brake inoperative.

THE AUTOMATIC BRAKE can be applied from the rear or from any portion of the train, if desired.

THE AUTOMATIC BRAKE will effect an increase of at least twenty-five per cent. in the efficient value of freight rolling stock, owing to the quicker time that can be made on the road, and the avoiding of delay at stations and sidings. Freight trains carrying perishable goods are being daily run on passenger schedules.

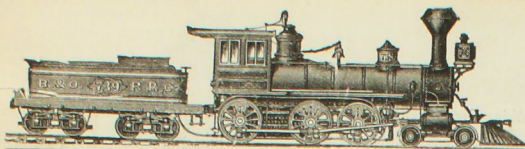
THE AUTOMATIC BRAKE, applied to freight cars, avoids the flattening of wheels and effects a yearly saving, in this item alone, nearly equal to the first cost of the apparatus.

THE AUTOMATIC BRAKE will prevent a greater part of the accidents to freight trains which form so large an item of expense in railway management.

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THE AUTOMATIC BRAKE is simple in construction and operation, and cheaply maintained, the working parts being combined in one piece of mechanism.

THE AUTOMATIC BRAKE is not an experiment, but is the result of many years of practical experience, and its capabilities are well known to all railway managers.



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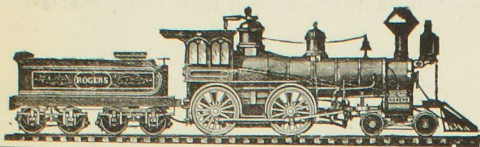
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From standard designs, or according to specifications, to suit purchasers.

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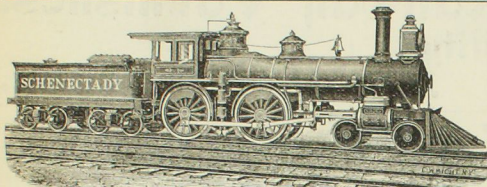
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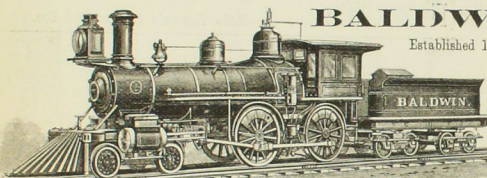
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Broad and Narrow-Gauge Locomotives; Mine Locomotives by Steam or Compressed Air; Plantation Locomotives; Noiseless Motors for Street Railways, etc.

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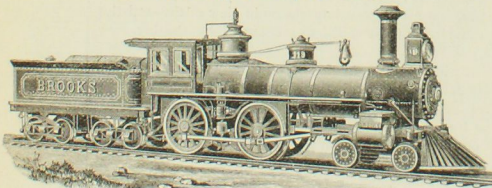
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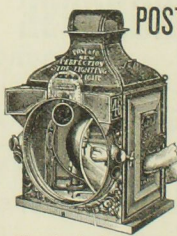
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ALL CLASSES OF LOCOMOTIVES AND THE THURBER STEEL WHEEL.

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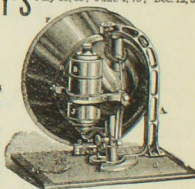
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